EPA-75

EXHAUST PERFORMANCE ANALYZER

operator's manual

SUN ELECTRIC
CORPORATION

INFRA-RED EXHAUST PERFORMANCE ANALYZER

SUN MODEL EPA-75

Sun Model EPA-75 is a portable, easy-to-use Exhaust Gas Analyzer of the Infra-Red type, used as an area tester for engine performance analysis and a Go-No-Go tester to determine exhaust emission levels. As a detail tester for locating fuel system problems it becomes an important part of a total engine performance testing package consisting of Scope, Compression Tester, Tach Dwell Meter, Timing Advance Unit, Cylinder Leakage Tester and Vacuum Gauge.

It accurately measures the hydrocarbon (HC) and carbon monoxide (CO) emissions from internal combustion engines. Hydrocarbon (HC) is measured as N-Hexane in parts per million (PPM) and carbon monoxide (CO) is measured in percent (%).

Hydrocarbons present in the exhaust system represent unburned gasoline. An increase in the level of HC emission is a direct result of poor compression and/or misfiring. Just one spark plug not firing will raise the HC emission by many times the normal reading in PPM. Carbon Monoxide is a by-product of fuel after it is burned in the combustion chamber. An overly-rich mixture will cause a high reading on the CO meter.

Exhaust gas samples are continuously picked up by means of a probe inserted in the vehicle's tail pipe and are conveyed to the exhaust gas analyzer by means of a special plastic hose. The Infra-Red analyzing device in the EPA-75 determines the exact amount of hydrocarbons and carbon monoxide contained in the sample. This data is then converted into electrical signals and read out on the respective meters.

Since governing bodies in several states and metropolitan localities have already set specifications limiting allowable exhaust emissions, the future trends can only be to still further lower the levels of emissions allowed. The EPA-75 has been designed and built not only to test present vehicles for compliance with established standards, but also to provide the scale ranges and accuracy necessary to test vehicles for compliance with the anticipated standards of the future.

Besides measuring emission levels to determine compliance with legal standards, you can perform emission tests at several speeds and under various conditions to quickly uncover a variety of engine, ignition and fuel system service requirements. This Infra-Red Tester provides the accuracy and range for checking and adjusting carburetors, particularly on late model engines. It also serves as a valuable quality-control tool after tune-up, to aid in determining whether all work was performed properly. By using the following easy step-by-step procedures you will find that in only a few minutes, operating the EPA-75 will be a snap.

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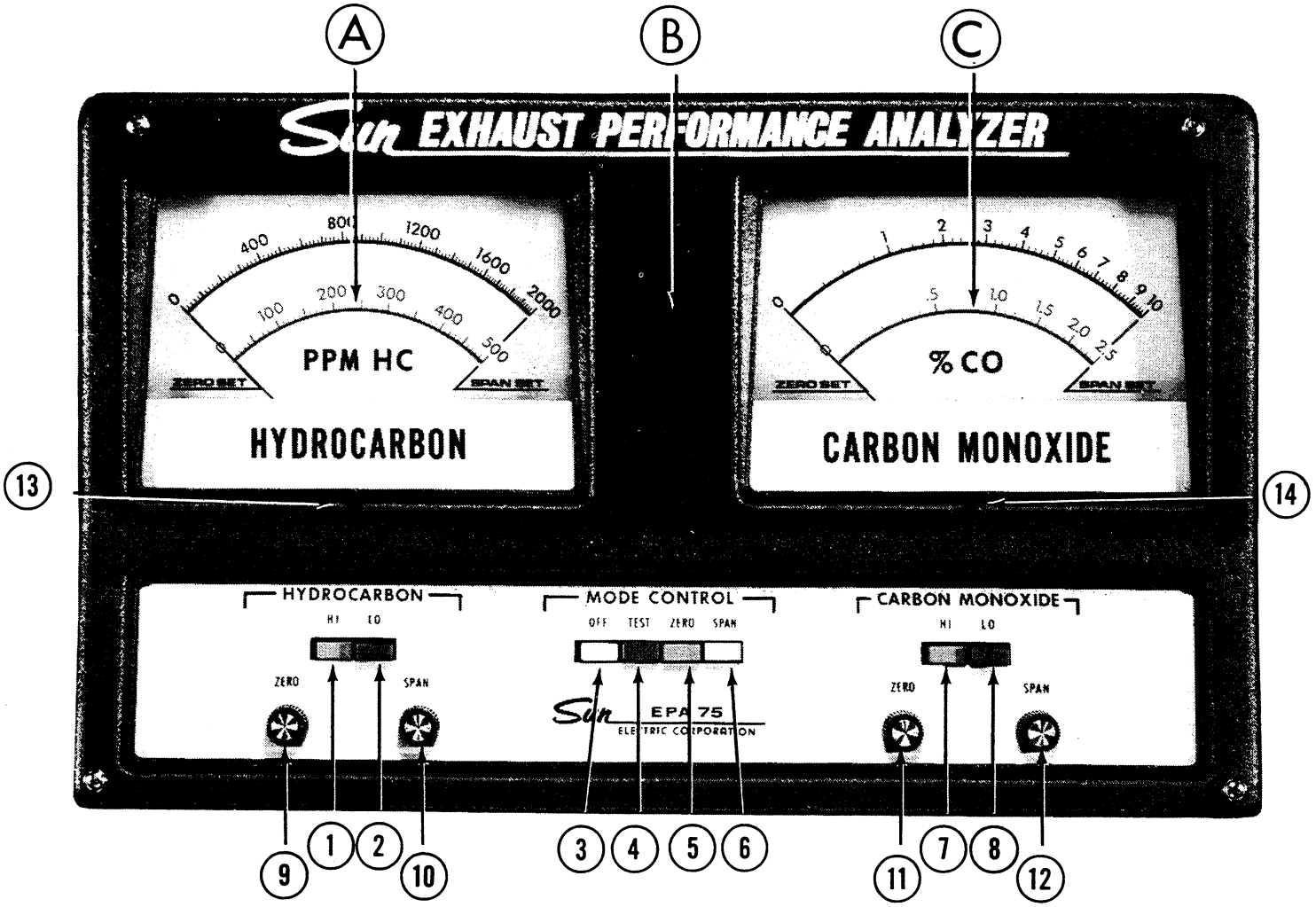
METERS AND CONTROLS



METERS & INDICATOR

A. Hydrocarbon meter - 2 color-coded scales.
B. "Low Flow/Check Filter" indicator - (lights if filters or sample hose is restricted).
C. Carbon Monoxide meter - 2 color-coded scales.

HYDROCARBON - PUSH BUTTONS

1. "HI" sets HC meter to read on Blue 0 - 2000 PPM scale.
2. "LO" sets HC meter to read on Red 0 - 500 PPM scale.

MODE CONTROL - PUSH BUTTONS

3. "OFF" - Turns tester off.
4. "TEST" - Turns tester on in test function.
5. "ZERO" - Turns tester on to Zero meter function.
6. "SPAN" - Depress and hold while adjusting meters to "SPAN SET" line. (Low Flow/Check Filter indicator should light as a check on the light).

NOTE:

Pushing the SPAN set button automatically places meter circuitry in LO position while depressed.

CARBON MONOXIDE - PUSH BUTTONS

7. "HI" sets CO meter to read on Blue 0 - 10% scale.
8. "LO" sets CO meter to read on Red 0 - 2.5% scale.

ROTATING CONTROLS

9. "Zero" - Sets HC meter to Zero set line.
10. "Span" - Sets HC meter to Span set line.
11. "Zero" - Sets CO meter to Zero set line.
12. "Span" - Sets CO meter to Span set line.

METER MECHANICAL ZERO

13. Adjusts Mechanical Zero of HC Meter.
14. Adjusts Mechanical Zero of CO Meter.

OPERATING INSTRUCTIONS

CONNECTION, WARM-UP AND CALIBRATION

1. Mechanically set meters to "Zero Set" line.
2. Plug power cord into suitable receptacle. (Refer to Tester nameplate located at top center on rear tester panel).
3. Depress "Zero" mode control push button and permit tester to operate for approximately 5 minutes.
4. Depress "LO" button for each meter.
5. Zero the Hydrocarbon meter, if necessary, by rotating the Hydrocarbon meter zero adjust knob until the Hydrocarbon meter pointer reads on its "Zero Set" line.
6. Zero the Carbon Monoxide meter, if necessary, by rotating the Carbon Monoxide zero adjust knob until the Carbon Monoxide meter pointer reads on its "Zero Set" line.
7. Depress and hold the "Span" mode control push button and if necessary, rotate the span adjust knobs until corresponding meters read on their respective "Span Set" lines.
8. Release "Span" push button and recheck zero adjustment of both meters.

NOTE: After initial warm-up and calibration, "Zero" and "Span" adjustments can be rechecked at any desired interval, even with the sample probe in the tail pipe of a running engine. To recheck calibration, always depress "Zero" and "Span" mode control push buttons in turn as in the initial calibration and note meter indications. Depress "Test" mode control push button to perform vehicle tests.

EXHAUST PERFORMANCE TESTING

1. Select "Hi" scale range of both meters by depressing the push button located below each meter.
2. Insert sampling probe approximately 12" into vehicle tail pipe.
   a. Be sure that the vehicle's exhaust system is air tight. Air leaking into the system could dilute the exhaust gas and affect the readings.
   b. When testing vehicles with dual exhaust, each side must be tested separately to insure that an exhaust sample from each bank of cylinders has been analyzed.
3. Depress "Test" mode control push button.
4. Operate engine at desired test speed, and note and record readings of both meters. (If HC meter reads less than 500 PPM and/or CO meter reads less than 2.5%, switch to "LO" meter scales for more convenient meter readings by depressing the appropriate scale range push button).
5. If exhaust performance tests are to be conducted at more than one engine speed, readjust engine speed as necessary and repeat step 4 above.
6. At the conclusion of the tests, depress the "Zero" mode control push button.
7. Remove sample probe from the vehicle tailpipe.

NOTE: Allowing the mode control switch to remain in the "Zero" position during intervals between tests, the tester will be ready for use without further warm up and filter life will be extended. To turn tester completely off, depress the "OFF" mode control push button.

GO NO-GO ENGINE PERFORMANCE TEST

Make tests with engine at normal operating temperature. Refer to manufacturer's specifications and local exhaust emission limits. If specifications are not available, use the suggested specifications listed below as a guide.

PROCEDURE

1. Measure HC and CO at 2500 RPM.*
2. Measure HC and CO at idle RPM.
3. Compare readings with specifications.

GO	HC and CO readings within specifications at idle and 2500 RPM.
NO-GO	HC or CO readings exceed specificatons at either idle or at 2500 RPM. Corrective service is required.

SUGGESTED GO NO-GO SPECIFICATIONS

Emission Controlled Vehicles.
HC less than 400 PPM, CO less than 3%.

Non-Controlled Vehicles.
HC less than 900 PPM, CO less than 6%.

Most properly tuned engines in good condition will test below these suggested limits.

Vehicles which exceed these specifications are high polluters and need service. On these vehicles, performance can be improved and pollution reduced by proper tune-up and/or engine work.

*When testing electronic fuel injected vehicles without a load, only idle readings will be accurate. Testing of these engines at 2500 RPM must be done on a dynamometer.

COMMON CAUSES OF EXCESSIVE EMISSIONS

Higher than normal Hydrocarbon readings can be caused by any one or more of the following conditions: —

Improper ignition timing
Ignition system malfunctions (misfire)
Excessively rich or lean carburetor
Engine problems - such as: —

Low compression
Leaky gaskets
Defective valves, guides or lifters
Defective rings, pistons or cylinders

Higher than normal Carbon Monoxide readings can be caused by any one or more of the following conditions: —

Rich carburetor
Dirty air cleaner
Defective choke
Improper idle speed

Higher than normal Hydrocarbon and Carbon Monoxide readings can be caused by any one or more of the following conditions: —

Inoperative PCV system
Heat riser stuck open
Air pump inoperative or disconnected
Sticking air cleaner preheat door

To pinpoint specific compression and ignition system deficiencies, conduct detailed tests of these areas utilizing the facilities of a complete electronic engine tester.

After tune-up, recheck emission levels using the EPA-75. 1971 and newer vehicles, when properly tuned, can have CO levels below 1%, and HC levels below 200 PPM.

Refer to manufacturer's specifications usually found on a sticker under the hood, or refer to a Sun Specification card.

CARBURETOR ADJUSTMENT AND TESTING

Adjusting and testing carburetor operation with the Infra-Red Exhaust Performance Tester requires only that you remember how each thing you are changing should affect the air/fuel mixture. If you do something to make the engine run richer, the CO level should increase. If you make the air/fuel mixture leaner the CO should decrease. If you make the mixture so lean that one or more cylinders misfire, then the HC level will increase.

Make all carburetor idle and mixture adjustments as per manufacturer's recommended procedure. Where the manufacturer gives a CO setting, use the EPA-75 to make these adjustments. On vehicles where CO specifications are not available, use the EPA-75 to make sure the HC and CO levels are below state and local legal limits and are normal for the year and make of vehicle being tested. If you are unable to attain the desired HC and CO level by following the manufacturer's adjustment procedures, there may be problems such as faulty ignition or compression. These areas should be thoroughly tested before condemning the carburetor.

IDLE ADJUSTMENT AFTER MAJOR CARBURETOR OVERHAUL OR REPAIR

1. Lightly seat idle mixture adjusting screws.
2. Back out each screw approximately 4 turns or to internal stops if so equipped.
3. Start engine and warm up to normal operating temperatures.
4. Calibrate the EPA-75, insert probe into tail pipe and depress "test" mode control push button.
5. Adjust engine idle speed to manufacturer's specifications.
6. Gradually adjust mixture screws equally to obtain the lowest HC reading and smoothest idle.
7. Readjust idle speed as necessary after each mixture adjustment to maintain specified idle RPM.
8. Gradually adjust idle mixture screws equally to obtain lowest CO reading without increasing the HC reading.
9. All readings should be taken with air cleaner completely installed and at normal operating temperature.
10. HC and CO readings should now be within manufacturer's specification and/or legal limits with engine operating smoothly.

NOTE: If the idle adjustment process takes longer than two minutes, clean out engine by running it at approximately 2000 RPM for a few seconds.

PCV TEST

Follow this procedure to determine if the PCV system is functioning properly.

1. Remove the PCV Valve from the engine but do not remove it from the hose connected to the carburetor or intake manifold.
2. Plug the open end of the valve and read the CO meter.
3. If the CO reading increases, this means that the valve is working. However, if the CO remains the same or only increases slightly, this indicates the valve is not working. The PCV Valve or system could be plugged. Check for restriction and retest.

ACCELERATOR PUMP TEST

When the throttle is opened rapidly, the accelerator pump sprays fuel into the intake manifold to overcome the flat spot in acceleration caused by the resulting momentary drop in manifold vacuum.

To Test The Accelerator Pump

1. While observing the CO meter, with engine at normal idle speed, quickly open and release throttle.
2. The engine should increase speed without hesitation and the CO meter should show an increase in percentage of CO.
3. If the reading decreases before increasing, or does not increase, the carburetor needs either an accelerator pump linkage adjustment or a repair of the pump mechanism.

AIR PUMP TEST

On vehicles so equipped, an engine-driven air pump supplies fresh air to the exhaust manifold to allow further burning of the exhaust gases before they leave the tail pipe.

Test Effectiveness of System as Follows: —

1. Bring engine to normal operating temperature.
2. Calibrate Exhaust Performance Tester and insert sampling probe into tail pipe.
3. Operate engine at approximately 1000 RPM, depress "Test" mode control push button and note HC and CO readings.
4. Maintaining the same engine speed, disconnect the air supply hose leading from the air pump to the exhaust manifold and again note HC and CO readings.

   An increase in HC and CO readings is to be expected with hose disconnected if the air supply system is operating normally. If little or no increase in HC and CO readings are observed, examine all components in the air supply system and make repairs and corrections necessary.
5. Upon completion of the tests, reconnect air supply hose and reset engine idle speed to manufacturer's specifications.

MAINTENANCE

SAMPLING HOSE MAINTENANCE

Visually inspect sampling hose assembly daily for leaks, cuts, kinks or damage caused by vehicles accidentally running over it. Check fitting connections for tightness and leaks.

FILTERS

Packaged with the exhaust emission testers are extra exhaust filter elements which are to be used as necessary (see filter maintenance section of this manual).

REPLACEMENT PARTS FOR FIELD SERVICE

Description	Part No.
Exhaust Probe Assembly	7009-511
Slide Bracket Assembly	7020-1043
Handle	813-101
Flex Tube Assembly	7020-1094
Hose Assembly	3988-202
Filter Element (75 micron)	301-909
Filter Element (8 micron)	301-908

Replacement parts or service may be obtained by contacting your local Sun representative or your nearest Sun branch (see back cover).

PROBE MAINTENANCE

Visually inspect probe tip daily for damage. Examine holes in probe tip to insure they are not clogged. If holes are clogged, use a paper clip or stiff wire to clear holes of dirt or foreign matter. Check tightness of fitting connection to base assembly.

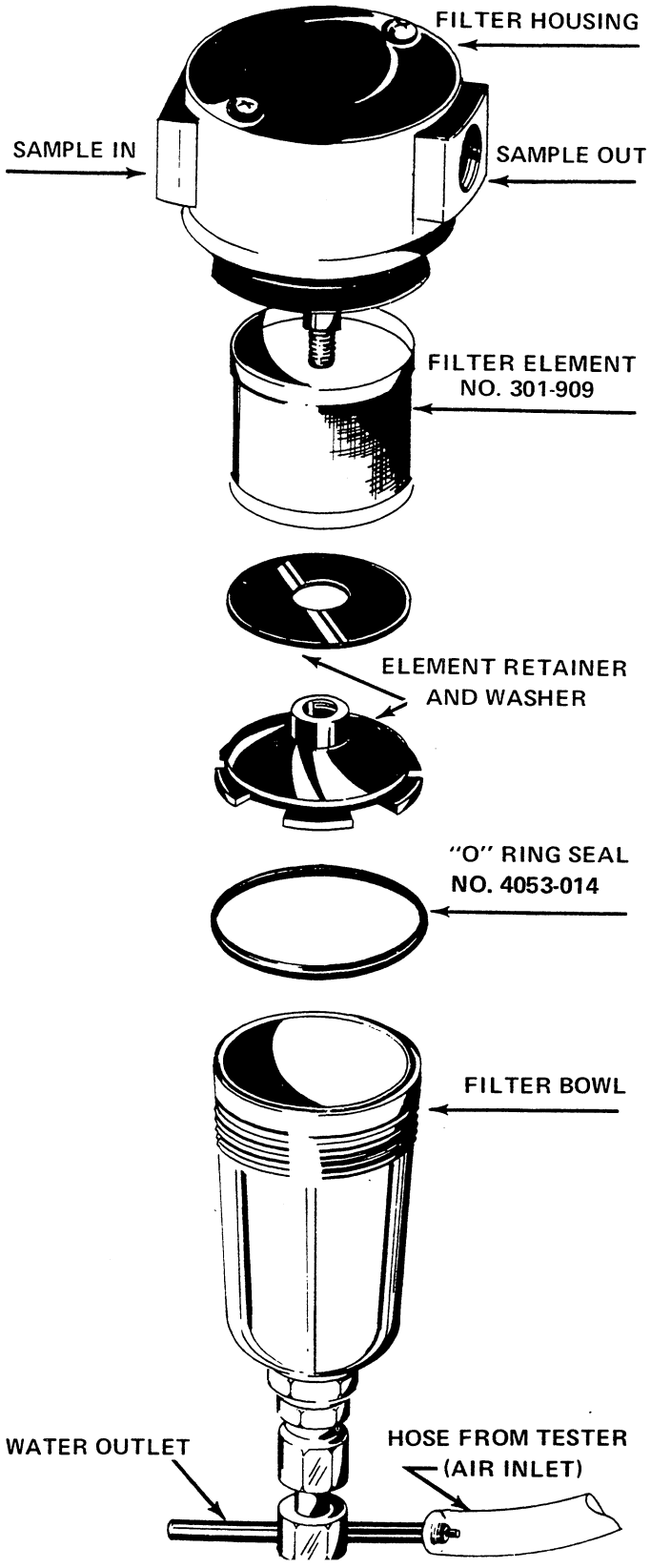
WARRANTY

Each new piece of equipment manufactured by SUN ELECTRIC CORPORATION is warranted for a period of one year after purchase and delivery to be free from defects of workmanship or material under normal use. Its obligation under warranty being limited to replacing or repairing at the factory or any branch any part or parts which shall have been returned to SUN ELECTRIC CORPORATION all transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been defective. This warranty shall not apply to equipment which has been repaired or altered in a manner which in the judgment of the manufacturer has adversely affected its operation. SUN ELECTRIC CORPORATION MAKES NO OTHER WARRANTY OF ANY KIND WHATEVER, EXPRESS OR IMPLIED; AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESTATED OBLIGATION ARE HEREBY DISCLAIMED BY SUN AND EXCLUDED FROM THIS AGREEMENT. SUN ELECTRIC CORPORATION does not authorize other persons to assume any liability in connection with the sale of its products. SUN ELECTRIC CORPORATION reserves the right to make changes in design and price of the equipment at any time without obligation for retroactive action.

FILTER MAINTENANCE

This tester is equipped with two filter units designed to prevent particulate contaminants and water from entering the analyzing system. The primary filter has an automatic water drain. The secondary filter has manual type bowl drain.

PRIMARY FILTER ASSEMBLY
NO. 301-099



EPA-75

When the "Low Flow/Check Filter" warning light comes on during vehicle testing, the sample filters should be serviced and the probe and sample hose checked.

When servicing filters, be sure that all seals are properly positioned and the units are re-assembled snugly to eliminate the possibility of outside air being drawn into the analyzer during vehicle tests.

PRIMARY FILTER SERVICE
(Element should be cleaned or replaced as necessary.)

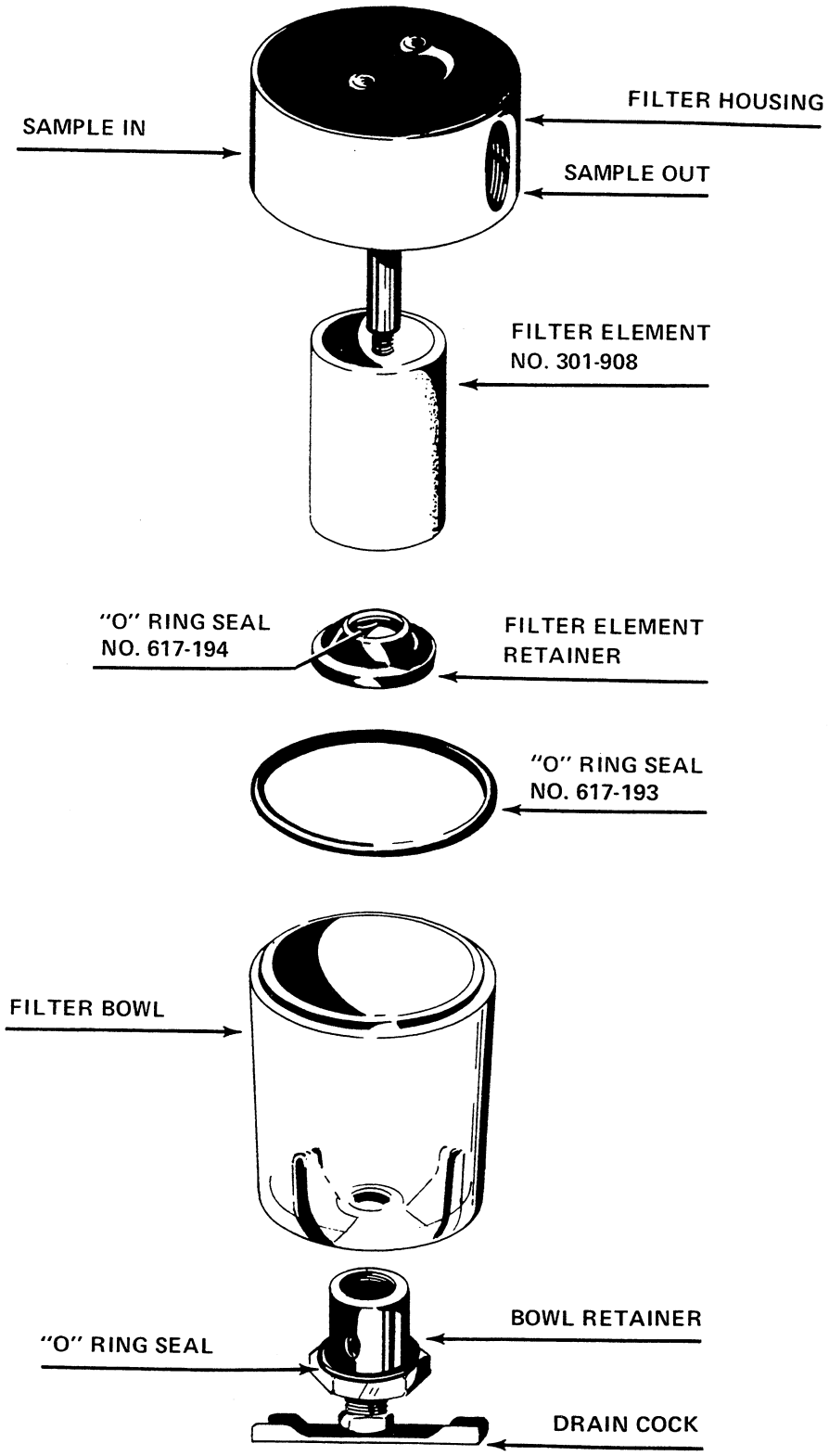
1. Remove outlet and inlet hoses from "T" fitting on lower part of bowl.
2. Unscrew filter bowl from housing by turning filter bowl counterclockwise. Note position of "O" ring seal on bowl rim.
3. Turn element retainer counterclockwise and remove filter element.
4. Clean bowl and element in a solution of detergent and water and air dry. If element replacement is necessary, use Sun. No. 301-909 filter element.
5. Assemble in reverse order making sure "O" ring is properly positioned in groove at upper edge of bowl. Reconnect inlet hose to side of "T" fitting that has the smallest opening.

SECONDARY FILTER SERVICE
(Element should be replaced as necessary.)

1. Remove bowl retainer at bottom of bowl by turning it counterclockwise and remove bowl.
2. Inspect "O" rings on retainer nut and bowl rim.
3. Remove filter retainer by pulling downward. Inspect retainer internal "O" ring.
4. Remove filter element and replace with Sun no. 301-908 element.
5. Wash bowl in a solution of detergent and water and air dry.
6. Assemble in reverse order making sure all "O" rings are properly positioned and drain cock is fully closed.

SECONDARY FILTER ASSEMBLY

NO. 301-097



ASSEMBLY INSTRUCTIONS MOUNTING KIT #120-210

(For cabinet mounting the Sun TUT-915 or EPA-75)

1. Place cradle support bracket on top of the Sun C-27 cabinet and align bolt holes.
2. Secure cradle support bracket to cabinet top with four 3/8-16 bolts and nuts provided.
3. Position the two pivot brackets and secure them to the bottom of the tester with the 10-32 screws provided.
4. Mount tester by positioning the pivot pins of the pivot brackets into the slots on the cradle support bracket.
5. Assemble two each plastic knobs and screw shafts.
6. Secure tester in desired viewing position by installing screw shafts through holes in cradle support bracket and into one of the five positioning holes in each pivot bracket.
7. Place rubber matting on cabinet top in front of tester.

692-823

FILTER MAINTENANCE

FOR SUN INFRA-RED EXHAUST PERFORMANCE ANALYZERS, MODEL EET-910-I, U-912-I AND EPA-75

These testers are equipped with two filter units designed to prevent particulate contaminants and water from entering the analyzing system. The primary filter has an automatic water drain. The secondary filter has manual type bowl drain.

U-912-I and EET-910-I

When the exhaust flow indicator ball falls below the operating range into the red area, the sample filters should be serviced.

EPA-75

When the "check filter" warning light comes on during vehicle testing, the sample filters should be serviced.

When servicing filters, be sure that all seals are properly positioned and the units are re-assembled snugly to eliminate the possibility of outside air being drawn into the analyzer during vehicle tests.

PRIMARY FILTER SERVICE

(Element should be cleaned or replaced as necessary)

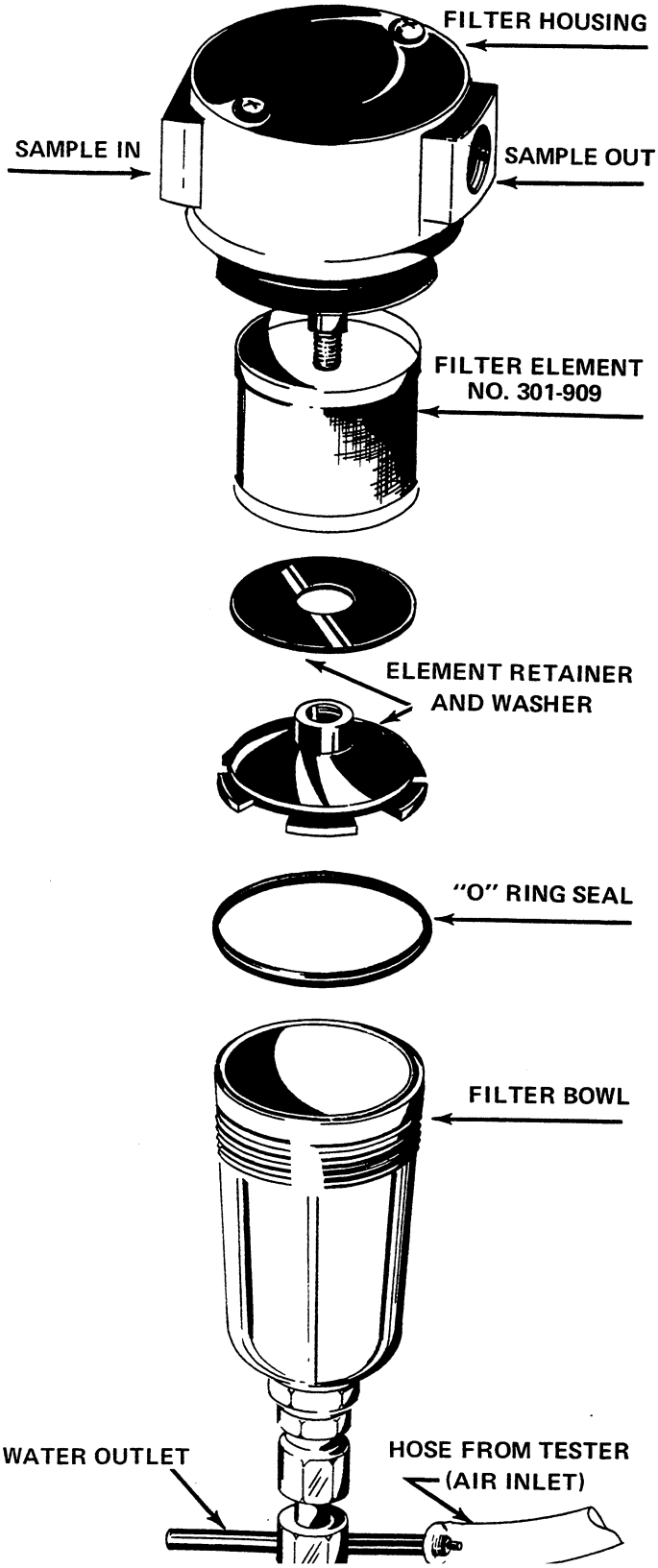
1. Remove outlet and inlet hoses from "T" fitting on lower part of bowl.
2. Unscrew filter bowl from housing by turning filter bowl counterclockwise. Note position of "O" ring seal on bowl rim.
3. Turn element retainer counterclockwise and remove filter element.
4. Clean bowl and element in a solution of detergent and water and air dry. If element replacement is necessary, use Sun No. 301-909 filter element.
5. Assemble in reverse order making sure "O" ring is properly positioned in groove at upper edge of bowl. Reconnect inlet hose to side of "T" fitting that has the smallest opening.

SECONDARY FILTER SERVICE

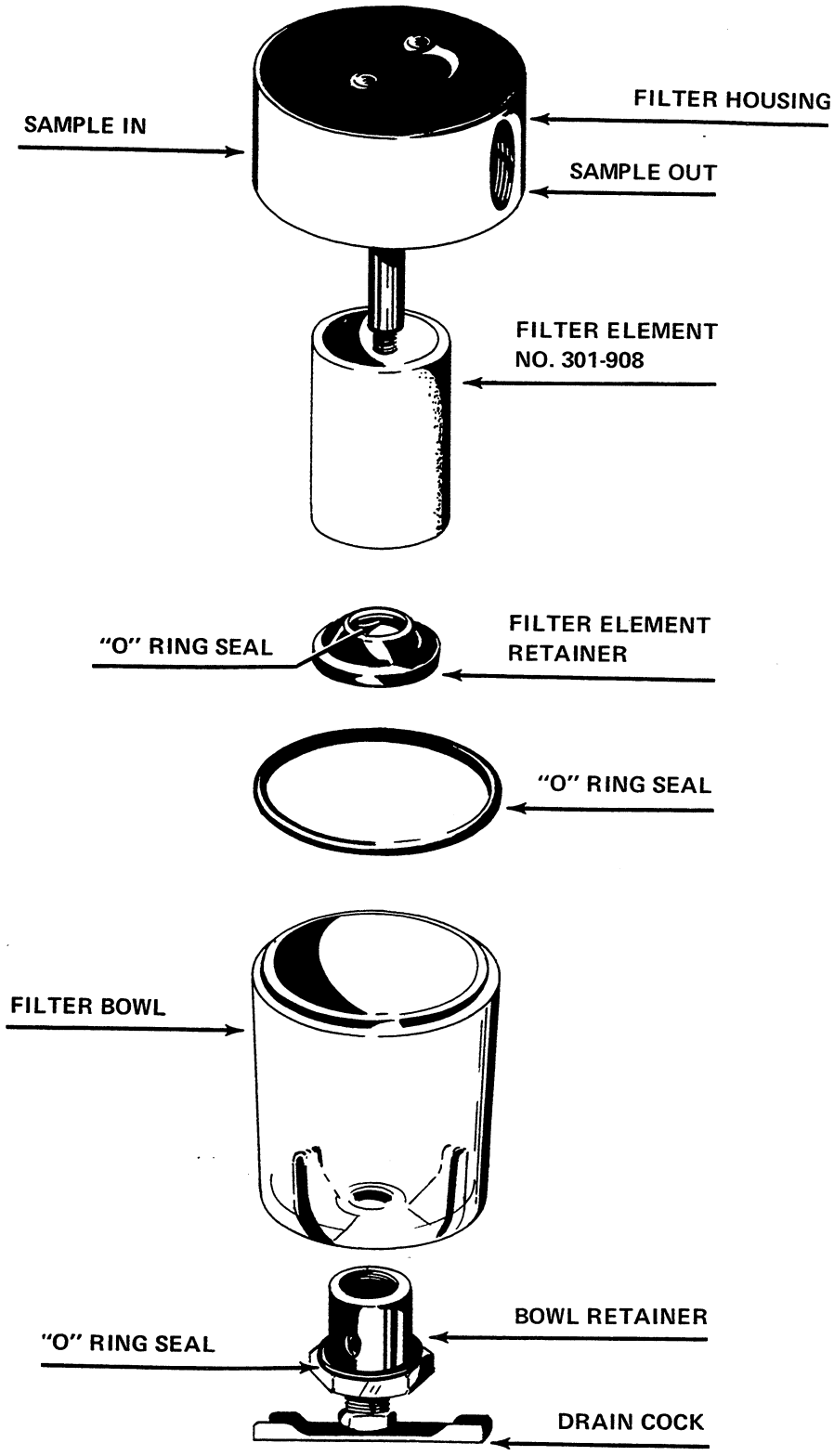
(Element should be replaced as necessary)

1. Remove bowl retainer at bottom of bowl by turning it counterclockwise and remove bowl.
2. Inspect "O" rings on retainer nut and bowl rim.
3. Remove filter retainer by pulling downward. Inspect retainer internal "O" ring.
4. Remove filter element and replace with Sun no. 301-908 element.
5. Wash bowl in a solution of detergent and water and air dry.
6. Assemble in reverse order making sure all "O" rings are properly positioned and drain cock is fully closed.

PRIMARY FILTER ASSEMBLY



SECONDARY FILTER ASSEMBLY



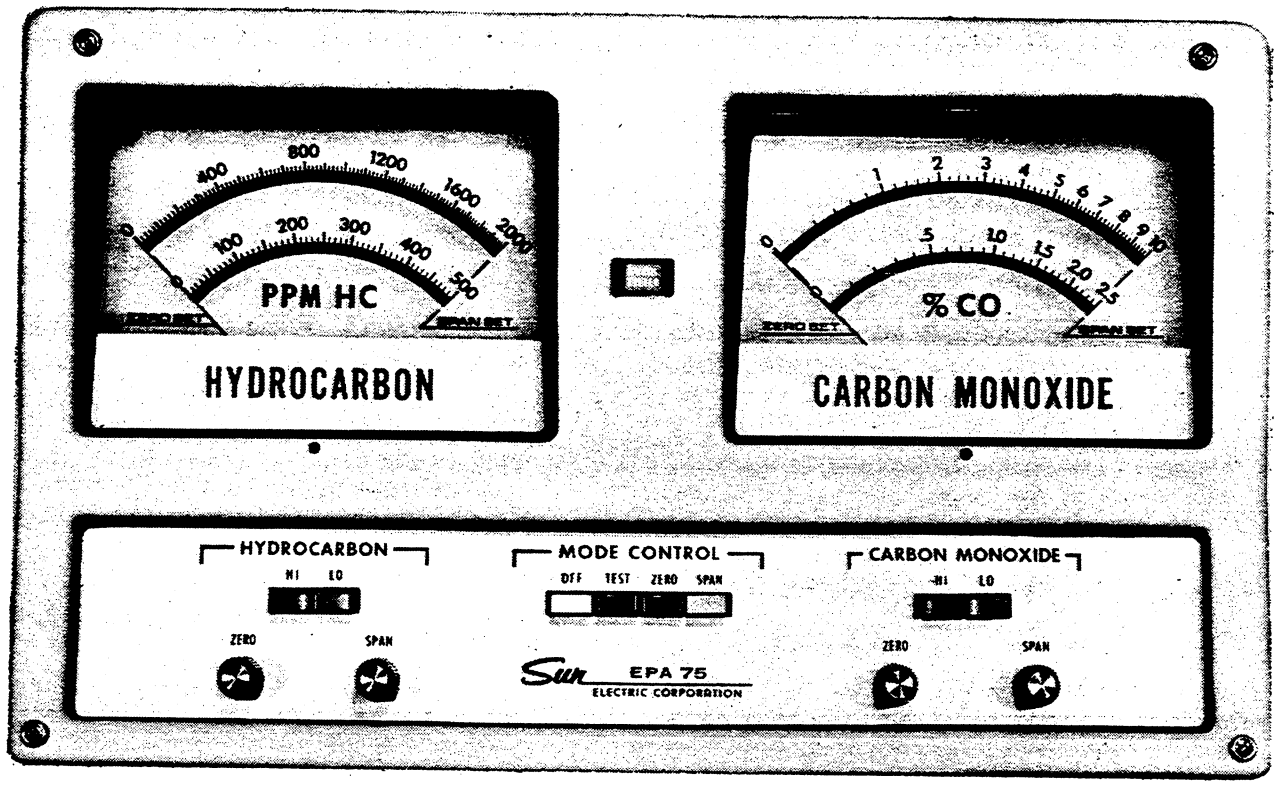
Sun ELECTRIC CORPORATION
HARLEM AND AVONDALE • CHICAGO, ILLINOIS U.S.A. 60631

QUICK REFERENCE GUIDE

ED OFFICE COPY

EXHAUST PERFORMANCE TESTING

Using Sun's Exhaust Performance Analyzer, Model EPA-75



METERS AND CONTROLS

HYDROCARBON METER..... Reads in parts per million (PPM)

CARBON MONOXIDE METER ..... Reads in percent (%)

MODE CONTROL ..... Pushbuttons to select test or calibrate modes, or to turn tester off.

READ-OUT CONTROLS..... For each meter

Hi-Lo Push Buttons.....For meter scale range selection

Zero and Span Knobs..... For Zero Set and Span Set calibration

"CHECK FILTER" INDICATOR ..... Lights when filters require service (Also lights during Span Set as a lampcheck).

OVERLOAD PROTECTION..... Circuit breaker located on rear of cabinet.

CALIBRATION

1. Plug power cord into suitable receptacle. (Refer to tester nameplate).
2. Depress blue "Zero" mode control button and allow tester to warm up for 5 minutes.
3. Adjust "Zero" knobs below meters until both meter pointers read "Zero Set".
4. Depress and hold grey "Span" mode control button while adjusting "Span" knobs below meters until both meter pointers read "Span Set".
5. Release "Span" button and recheck "Zero" adjustment.

NOTE: During first 15 minutes of operation, tester may require slight additional calibration adjustments. Calibration can be checked at any time by repeating steps above. It is not necessary to remove sample probe from tailpipe or to stop vehicle engine to recheck calibration of tester.

EXHAUST PERFORMANCE TESTING

1. Select "Hi" scale range of both meters.
2. Insert sampling probe into vehicle tailpipe.
3. Depress Red "Test" mode control button.
4. Operate engine at desired test speed and note and record readings of both meters. (If HC meter reads less than 500 PPM and/or CO meter reads less than 2.5%, switch to "LO" meter scales for more convenient meter readings by depressing the appropriate scale range push button).
5. If exhaust performance tests are to be conducted at more than one engine speed, readjust engine speed as necessary and repeat step 4 above.
6. When tests are concluded, push blue "Zero" button and remove sample probe from vehicle tailpipe.

GO AND NO-GO ENGINE PERFORMANCE TEST

Make tests with engine at normal operating temperature. Refer to manufacturer's specifications and local exhaust emission limits. If specifications are not available, use the suggested specifications listed below as a guide.

1. Note and record HC and CO readings at 2500 engine RPM.
2. Note and record HC and CO readings at idle RPM.
3. Compare test readings with specifications.

GO — HC and CO readings within specifications at both idle and 2500 RPM.

NO-GO — HC or CO readings exceed specifications at either idle or 2500 RPM.

SUGGESTED GO AND NO-GO SPECIFICATIONS

IDLE RPM — Emission controlled vehicles
HC less than 400 PPM CO less than 3%.

Non-Controlled Vehicles
HC less than 900 PPM CO less than 6%.

2500 RPM — Readings should be less than those observed at idle.

Vehicles which exceed these specifications are high polluters and need service. On these vehicles, performance can be improved and pollution reduced by proper tune-up and/or engine work.

COMMON CAUSES OF EXCESSIVE EMISSIONS

Higher than normal Hydrocarbon readings can be caused by any one or more of the following conditions:—

Improper ignition timing.
Ignition system malfunctions (misfire)
Excessively rich or lean carburetor
Engine problems - such as:—

Low compression
Leaky gaskets
Defective valves, guide or lifters
Defective rings, pistons or cylinders

Higher than normal Carbon Monoxide readings can be caused by any one or more of the following conditions:—

Rich carburetor
Dirty air cleaner
Defective choke
Improper idle speed

Higher than normal Hydrocarbon and Carbon Monoxide readings can be caused by any one or more of the following conditions:—

Inoperative PCV system
Heat riser stuck open
Air pump inoperative or disconnected
Sticking air cleaner preheat door.

To pinpoint specific compression and ignition system deficiencies, conduct detailed tests of these areas utilizing the facilities of a complete electronic engine tester.

After tune-up, recheck emission levels using the EPA-75. 1971 and newer vehicles, when properly tuned, can have CO levels below 1%, and HC levels below 200 PPM.

Refer to manufacturer's specifications usually found on a sticker under the hood, or see Sun Specification card.

Sun SERVICE CONTROL SYSTEM

Sun ELECTRIC CORPORATION
HARLEM AND AVONDALE • CHICAGO, ILLINOIS U.S.A. 60631
692-822 (5/73)
Printed in U.S.A.

SUN GAS CALIBRATION SERVICE BULLETIN FOR CALIFORNIA

FOR TESTER MODELS EPA-75 AND AET-330

GAS CALIBRATION PROCEDURE

Although your Infra-Red Analyzer has been factory adjusted and calibrated to assure optimum accuracy, the California Bureau of Automotive Repair requires that the owner be given the opportunity to gas calibrate the instrument. If the analyzer will not meet the parameters described in the "Calibration Check Procedure", contained in the Instruction Manual it is recommended that you contact your local Sun Representative for service.

WARNING

If you attempt gas calibration yourself, Sun Electric Corporation and/or (in the case of the AET-330) Atlas Supply Company will not assume any liability or responsibility for either damage to the instrument or injury to your person. The warranty for this tester will be voided to the extent of any malfunction which is determined to have been caused by any incorrect calibration attempt. Also, since portions of the tester carry potentially lethal voltages, caution should be exercised to insure that only the components mentioned in the following procedure are touched or adjusted by the operator.

In keeping with the requirements of the law, the manufacturer provides the following procedure:

CALIBRATION PROCEDURE

Use the following procedure to calibrate either the HC or the CO channel. **Calibrate one channel fully before proceeding with the other.**

A) Remove the two (2) screws (upper corners) on each side of the unit and remove the side panels.

B) Plug the power cord into a 120V 60 HZ power receptacle.

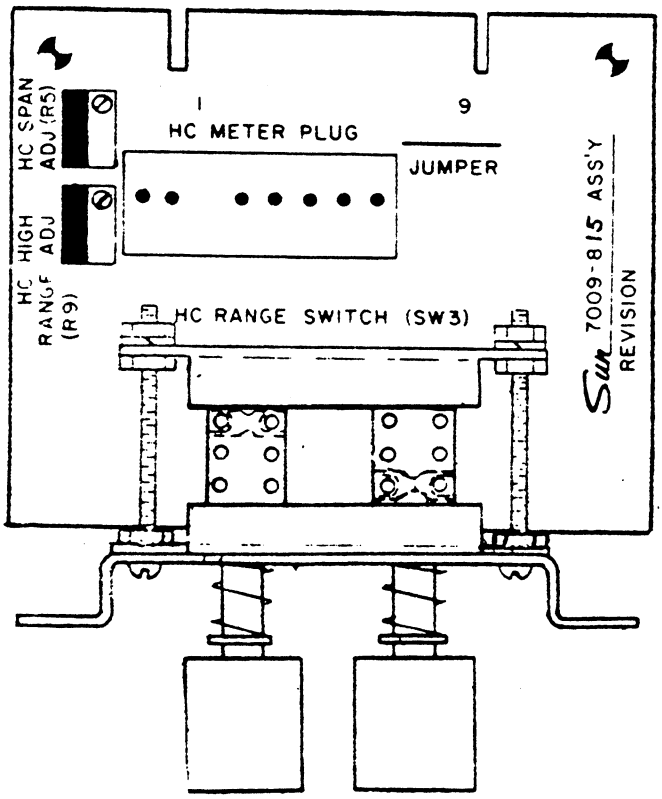
C) Turn unit on by pressing the Zero Mode button.

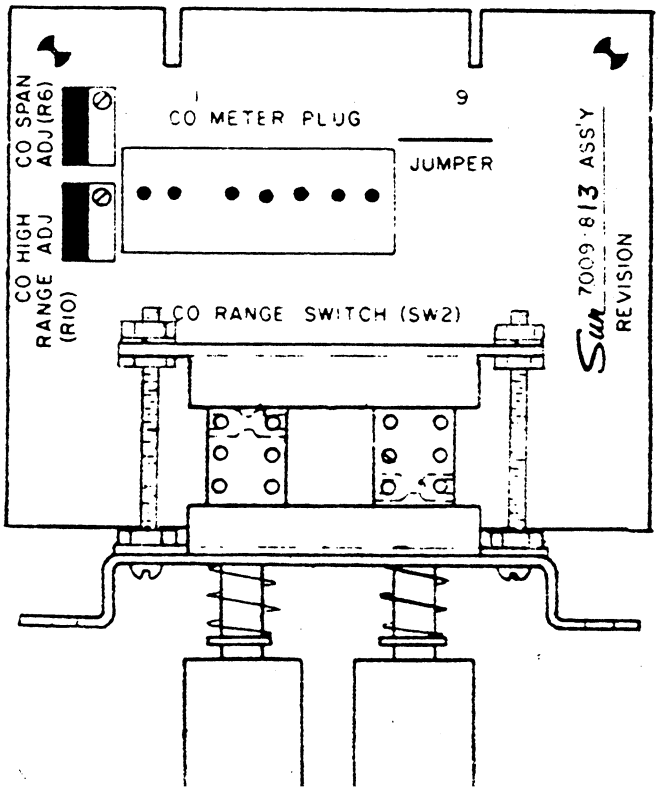
D) Allow unit to stabilize for 15 minutes.

NOTE: If power is removed momentarily after the unit is stabilized, the unit must be allowed to restabilize for an additional 10 minutes.

E) Zero the meters with the front panel zero control.

F) On the LO range, adjust the meter pointers to read 400 PPM HC and 2.0% CO using the front panel Zero Controls.





G) Push the HI range buttons in and adjust with the Sun Calibration Tool PN-0001-0021 (part of Kit #120-223) , the High Range adj. trimpots (R9 for HC, R10 for CO; located on the Range Selector Switch PC board) see diagram, until the meter reads 400 PPM HC or 2.0% CO.

H) Zero meter with Front Panel Control.

I) Using the manufacturers Gas Calibration Kit, P/N 120-223, connect the certified calibration gas to the Cal Inlet of the unit.

J) Adjust the respective Flow Valve on the Gas Source until the balloon flutters (indicating an equalized pressure)

K) Adjust the front panel Span Control until the meter reading (High Range) agrees with the Certified Gas Value. DO NOT DISTURB THE SETTING OF THIS CONTROL FOR THE REMAINDER OF THE CALIBRATION.

L) Turn off the respective Gas Cylinder Valve and remove hose from Cal Inlet. Recheck Zero Setting.

M) Push in and hold the span button. Adjust with the Sun Calibration Tool PN-0001-0021 (part of Kit #120-223) , the span trimpot (R5 for HC, R6 for CO; located on the Range Selector PC board) see diagram, until the meter reads at the Span Set Line. Release the Span button.

N) Repeat Gas Calibration Check Procedure, as contained in the Manual.

O) Put side panels back on and secure with the four (4) screws removed in Step A.

Note: This information for use with testers sold in California only.

Sun ELECTRIC CORPORATION
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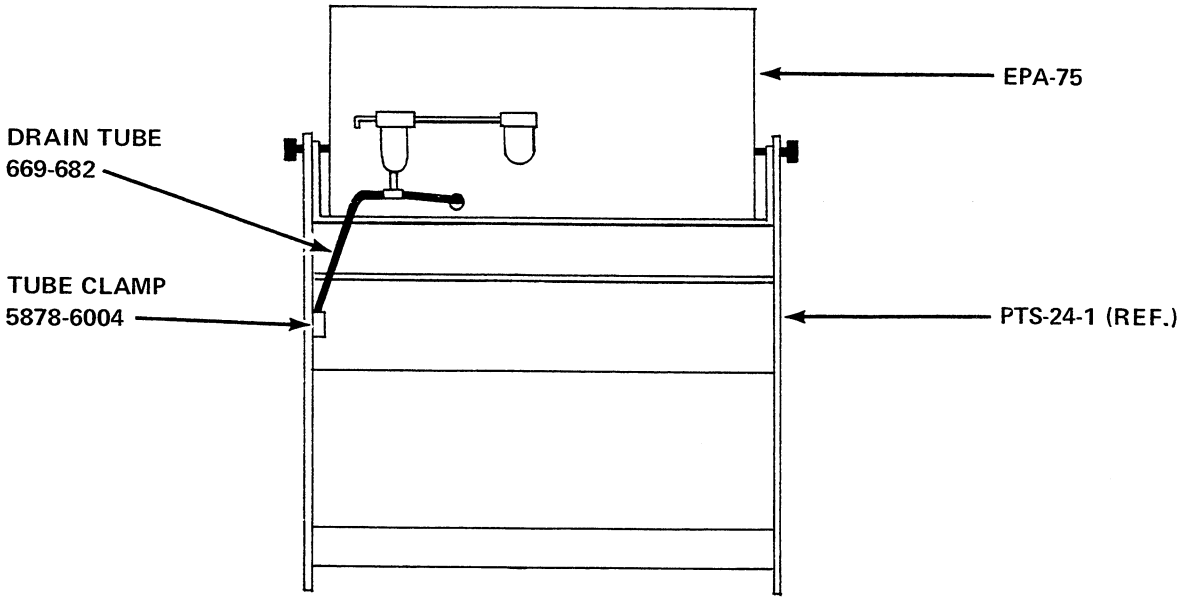
TUBE INSTALLATION,FILTER DRAIN WHEN EPA-75 IS USED WITH PTS-24-1 STAND.

Place EPA-75 in a horizontal position as viewed from the side and engage locking pin located on the right hand side of the stand. Attach the self-sticking tube clamp on the upper rear panel of the PTS-24 so that it is close to the left leg and midway between the top and bottom of the panel. Attach one end of the drain tube to the exit side of the aspirator located on the bottom of the inlet filter. Place the other end of the drain tube over the clamp so that approximately 1/4 inch of tube extends below the clamp. Press tube into the clamp.



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HARLEM AND AVONDALE • CHICAGO, ILLINOIS U.S.A. 60631

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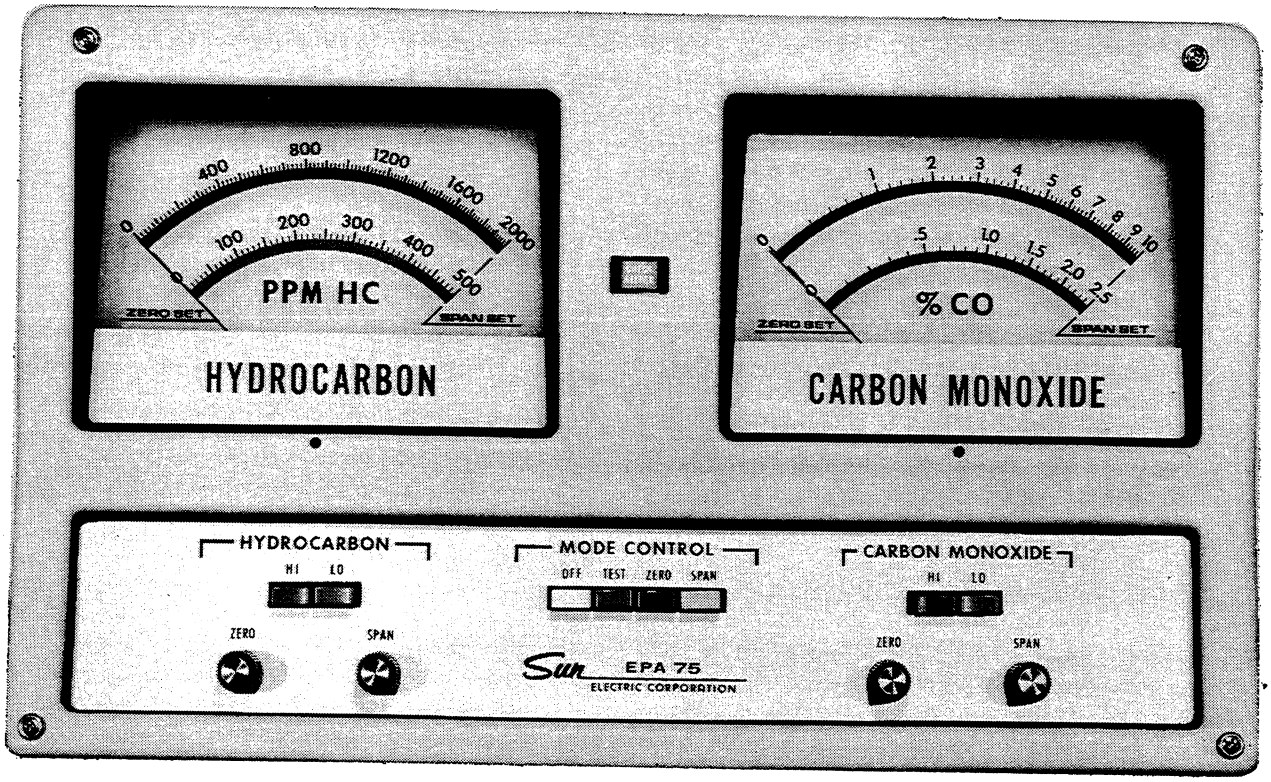
QUICK REFERENCE GUIDE

EXHAUST PERFORMANCE TESTING

Using Sun's Exhaust Performance Analyzer, Model EPA-75



METERS AND CONTROLS

HYDROCARBON METER..... Reads in parts per million (PPM)

CARBON MONOXIDE METER ..... Reads in percent (%)

MODE CONTROL..... Pushbuttons to select test or calibrate modes, or to turn tester off.

READ-OUT CONTROLS..... For each meter

Hi-Lo Push Buttons.....For meter scale range selection

Zero and Span Knobs..... For Zero Set and Span Set calibration

"CHECK FILTER"INDICATOR ..... Lights when filters require service (Also lights during Span Set as a lampcheck).

OVERLOAD PROTECTION..... Circuit breaker located on rear of cabinet.

CALIBRATION

1. Plug power cord into suitable receptacle. (Refer to tester nameplate).
2. Depress blue "Zero" mode control button and allow tester to warm up for 5 minutes.
3. Adjust "Zero" knobs below meters until both meter pointers read "Zero Set".
4. Depress and hold grey "Span" mode control button while adjusting "Span" knobs below meters until both meter pointers read "Span Set".
5. Release "Span" button and recheck "Zero" adjustment.

NOTE: During first 15 minutes of operation, tester may require slight additional calibration adjustments. Calibration can be checked at any time by repeating steps above. It is not necessary to remove sample probe from tailpipe or to stop vehicle engine to recheck calibration of tester.

EXHAUST PERFORMANCE TESTING

1. Select "Hi" scale range of both meters.
2. Insert sampling probe into vehicle tailpipe.
3. Depress Red "Test" mode control button.
4. Operate engine at desired test speed and note and record readings of both meters. (If HC meter reads less than 500 PPM and/or CO meter reads less than 2.5%, switch to "LO" meter scales for more convenient meter readings by depressing the appropriate scale range push button).
5. If exhaust performance tests are to be conducted at more than one engine speed, readjust engine speed as necessary and repeat step 4 above.
6. When tests are concluded, push blue "Zero" button and remove sample probe from vehicle tailpipe.

GO AND NO-GO ENGINE PERFORMANCE TEST

Make tests with engine at normal operating temperature. Refer to manufacturer's specifications and local exhaust emission limits. If specifications are not available, use the suggested specifications listed below as a guide.

1. Note and record HC and CO readings at 2500 engine RPM.
2. Note and record HC and CO readings at idle RPM.
3. Compare test readings with specifications.

GO — HC and CO readings within specifications at both idle and 2500 RPM.

NO-GO — HC or CO readings exceed specifications at either idle or 2500 RPM.

SUGGESTED GO AND NO-GO SPECIFICATIONS

~~IDLE RPM~~ Emission controlled vehicles
HC less than 400 PPM CO less than 3%.

Non-Controlled Vehicles
HC less than 900 PPM CO less than 6%.

~~2500 RPM Readings should be less than those observed at idle.~~

Vehicles which exceed these specifications are high polluters and need service. On these vehicles, performance can be improved and pollution reduced by proper tune-up and/or engine work.

COMMON CAUSES OF EXCESSIVE EMISSIONS

Higher than normal Hydrocarbon readings can be caused by any one or more of the following conditions:—

Improper ignition timing
Ignition system malfunctions (misfire)
Excessively rich or lean carburetor
Engine problems - such as:—

Low compression
Leaky gaskets
Defective valves, guide or lifters
Defective rings, pistons or cylinders

Higher than normal Carbon Monoxide readings can be caused by any one or more of the following conditions:—

Rich carburetor
Dirty air cleaner
Defective choke
Improper idle speed

Higher than normal Hydrocarbon and Carbon Monoxide readings can be caused by any one or more of the following conditions:—

Inoperative PCV system
Heat riser stuck open
Air pump inoperative or disconnected
Sticking air cleaner preheat door.

To pinpoint specific compression and ignition system deficiencies, conduct detailed tests of these areas utilizing the facilities of a complete electronic engine tester.

After tune-up, recheck emission levels using the EPA-75. 1971 and newer vehicles, when properly tuned, can have CO levels below 1%, and HC levels below 200 PPM.

Refer to manufacturer's specifications usually found on a sticker under the hood, or see Sun Specification card.

Sun SERVICE CONTROL SYSTEM

Sun ELECTRIC CORPORATION
HARLEM AND AVONDALE • CHICAGO, ILLINOIS U.S.A. 60631

692-822 (5/73)

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QUICK REFERENCE GUIDE

EPA-75 INFRARED EXHAUST GAS CALIBRATION CHECK PROCEDURE

GENERAL INFORMATION

Read all of the following directions before performing calibration check procedure.

Sun Gas Connection Kit #120-223 and a certified calibration gas are required to perform the gas calibration check procedure.

There are two kinds of calibration gas that may be used, propane or hexane. In the state of California, propane gas must be used for field calibration checks.

If propane type hydrocarbon (HC) gas is used, multiply the propane concentration as measured in PPM and denoted upon the bottle certification tag by the proper correlation factor appearing next to the "CALIBRATION GAS INLET" on the HC/CO analyzer. This value becomes the adjusted PPM concentration for the N-hexane equivalent of propane.

For example: If the propane gas used for calibration is a concentration of 3054 PPM and the propane correlation factor is .520, then the N-hexane equivalent of propane is 1588 PPM (3054 PPM x .520).

Once the above value has been computed, we suggest that you record it upon a piece of white adhesive tape and affix the tape to the gas bottle. The N-hexane equivalent of propane must be recomputed for each bottle of gas used and/or if more than one HC/CO analyzer with a different correlation factor is calibrated with the same bottle of gas.

If N-hexane calibration gas is used, it is not necessary to adjust the PPM concentration value.

Whether using propane or hexane gas, no adjustment to the CO concentration value is necessary.

PRELIMINARY MECHANICAL/ ELECTRICAL ZERO AND SPAN ADJUSTMENT

1. With tester off, mechanically zero each pointer to the ZERO SET LINE by turning the set screw directly below each meter.

   CAUTION: Be sure the sampling probe is placed where no debris or water will enter the probe.

2. Connect the tester to the proper electrical power source as specified on the serial nameplate.

3. If tester is equipped with OPERATING MODE/GAS CAL MODE switch (located on rear of tester), be sure it is in the "operating mode" position.

4. Depress the MODE CONTROL TEST button and allow the tester to warm up at least fifteen minutes. If for any reason the electrical power is interrupted (one to five seconds) after the initial warmup, an additional ten minutes must be allowed for the unit to re-stabilize.

5. After warmup, depress the MODE CONTROL ZERO button.

6. Depress the LO buttons under each of the two meters.

7. "Zero Set" meters in LO scale by turning the ZERO adjusting control knob for each meter until the pointer is on the ZERO SET LINE.

8. Depress and hold the SPAN button, (LOW FLOW LIGHT should light to check bulb operation). Adjust each SPAN control knob for each meter until the pointer is on the SPAN SET LINE.

9. Release SPAN button: Meters should indicate zero. If meters do not return to within one pointer width of the ZERO SET LINE, repeat steps 5 through 9.

10. Depress the HI button on each of the two meters. Meters should indicate zero. If meters do not return to within one pointer width of the ZERO SET LINE, repeat steps 5 through 9.

LOW AND HIGH SCALE COMPARISON CHECK

11. Depress the HC LO scale button and turn the ZERO control until the HC meter indicates 400 PPM and LO scale.

12. Depress the HC HI scale button. Pointer should indicate 400 PPM on HI scale within ± ½ division.

13. Push the HC LO scale button and turn the ZERO control of the HC meter until the pointer is on the ZERO SET LINE.

14. Depress the CO LO scale button and turn the ZERO control until the CO meter indicates 2.0% on the LO scale.

15. Depress CO HI scale button. Pointer should indicate 2.0% on HI scale within ± ½ division.

16. Push the CO LO scale button and turn the ZERO control of the CO meter until the pointer is on the ZERO SET LINE.

17. Return the HC and CO buttons to the HI scale positions.

GAS CALIBRATION CHECK

18. Connect the hose from the gas bottle to the inlet labeled "CALIBRATION GAS INLET" located on the rear of the tester. Refer to Gas Calibration Hook-Up Diagram.

19. If tester is equipped with OPERATING MODE/GAS CAL MODE switch, set the switch to "GAS CAL MODE" position. (This procedure conserves calibration gas.) If tester is equipped with the switch, proceed to step 20A. If tester is not equipped with the switch, proceed to step 20B.

20A. **Slowly** open the low pressure tank valve or flow control valve on the gas bottle until the in-line balloon **begins** to expand, (do not inflate) indicating a flow of gas into the tester. After meter readings stabilize (about 5 to 10 seconds), close valve on the gas bottle. Proceed to step 21.

20B. **Slowly** open the low pressure tank valve or flow control valve on the gas bottle until the in-line balloon **begins** to expand (do not inflate) indicating a flow of gas into the tester.

21. Read HC meter in the 0-2000 scale. If the PPM reading of HC is within ± 60 PPM of the N-hexane or N-hexane equivalent concentration, the HC section is correctly calibrated.

    For example: If the HC gas sample has a concentration of 1588 PPM, the meter may indicate ± 60 PPM or from 1528 to 1648 and be within specified tolerance limits.

22. Read CO meter in the 0-10 scale. If the % CO meter reading is within ±.3% of the certified % CO sample, the CO section is correctly calibrated.

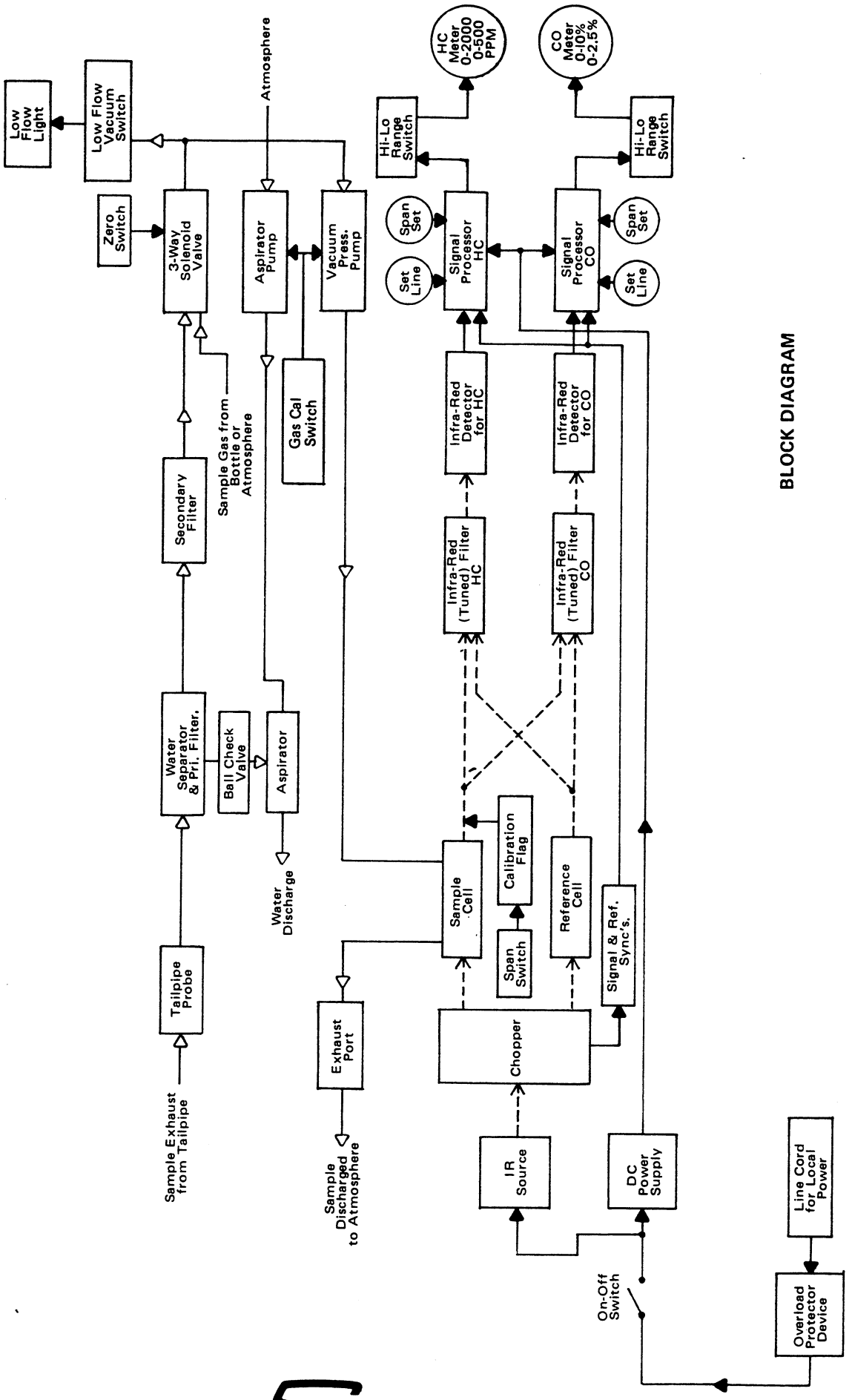
    For example: If certified CO gas sample is 7.56%, the meter may indicate ±.3%, or from 7.26% to 7.86% CO and be within specified tolerance limits.

23. Close valve on gas bottle (already done if step 20A was followed) and disconnect hose from gas inlet.

24. Return OPERATING MODE/GAS CAL MODE switch (if tester so equipped) to "OPERATING MODE" to expel gas from sample cell.

    If test results are not within allowable tolerances, service is required and you should contact your local Sun representative.

    If separate containers of HC and CO gas are utilized to perform the calibration check, steps 18 through 24 will be performed for each container with the exception of step 21 when checking CO and step 22 when checking HC.



BLOCK DIAGRAM

SUN ELECTRIC CORPORATION
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692-1071 (1820)

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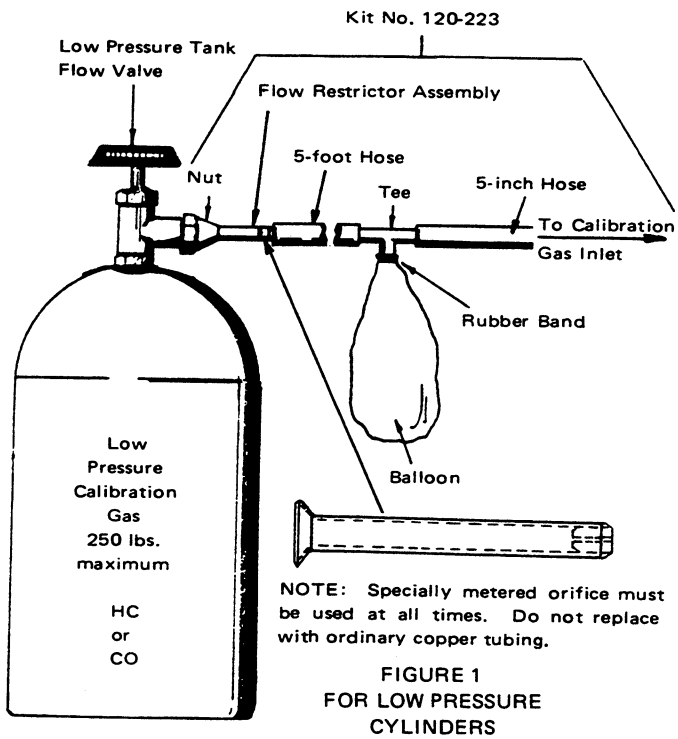
GAS CALIBRATION HOOKUP DIAGRAM

For Sun Electric Corporation Kit No. 120-223

RECOMMENDED CALIBRATION HOOKUP PROCEDURE



NOTE: Specially metered orifice must be used at all times. Do not replace with ordinary copper tubing.

FIGURE 1
FOR LOW PRESSURE CYLINDERS

LOW PRESSURE HOOKUP—Use Figure 1 as a guide:

1. Place threaded end of flare nut No. 647-5904 over non-flared end of Flow Restrictor Assembly No. 7009-0875.
2. Fit 5-foot hose No. 669-229 over non-flared end of Flow Restrictor Assembly.
3. Fit tee No. 7009-0853 into other end of the 5-foot hose.
4. Fit 5-inch hose No. 669-229 over the other end of tee.
5. Fit balloon over remaining tee port and secure with rubber band.
6. Attach kit to tank with flare nut No. 647-5904.
7. Attach kit to tester by fitting 5-inch hose over calibration gas inlet port.
8. Follow instructions under calibration check procedure for calibration gas check.

PARTS LIST FOR GAS CONNECTION KIT NO. 120-223

PART DESCRIPTION	PART NUMBER
Plastic hose 5 in. x 3/16-in. I.D.	669-229
Plastic hose 5 ft. x 3/16-in. I.D.	669-229
Manifold--Balloon Assembly	7009-0853
Flow Restrictor Assembly	7009-0875
Nut, 1/4-in., S.A.E. flare	647-5904

OPTIONAL CALIBRATION HOOKUP PROCEDURE

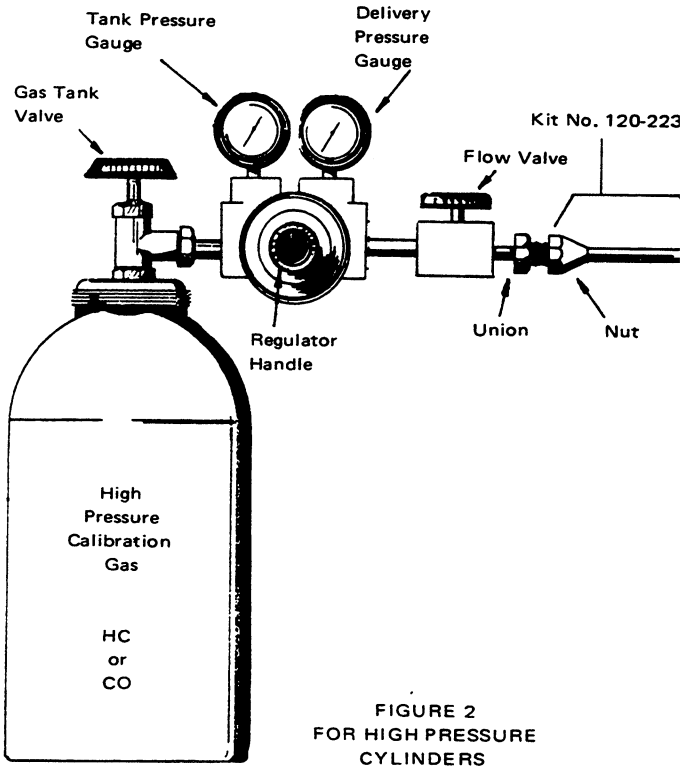


FIGURE 2
FOR HIGH PRESSURE CYLINDERS

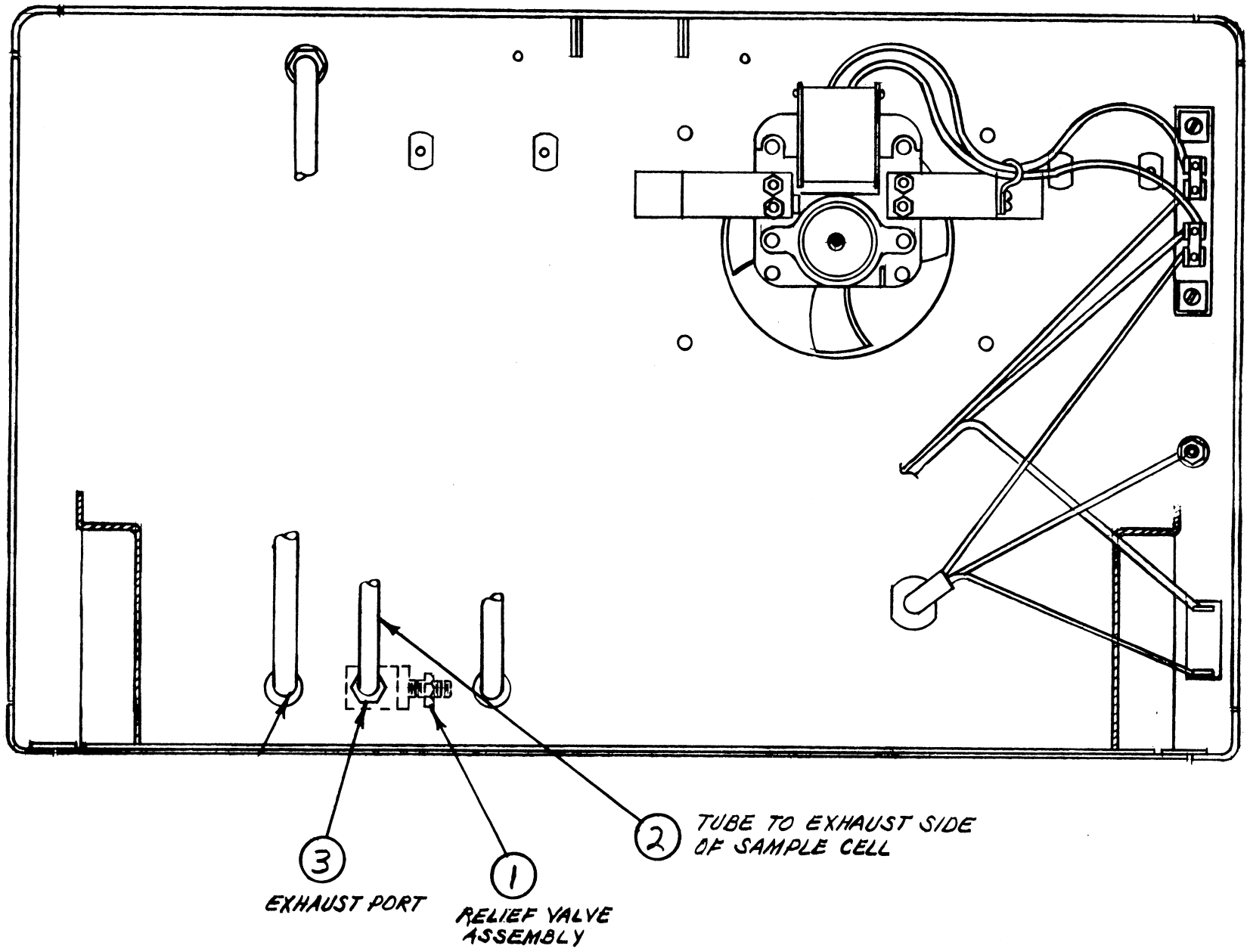
OPTIONAL EQUIPMENT NEEDED FOR HIGH PRESSURE TESTING (not supplied by Sun)...Regulator and Flow Valve Model No. 201-3150 with a 350 CGA inlet regulator. This part is available from Union Carbide Corporation.

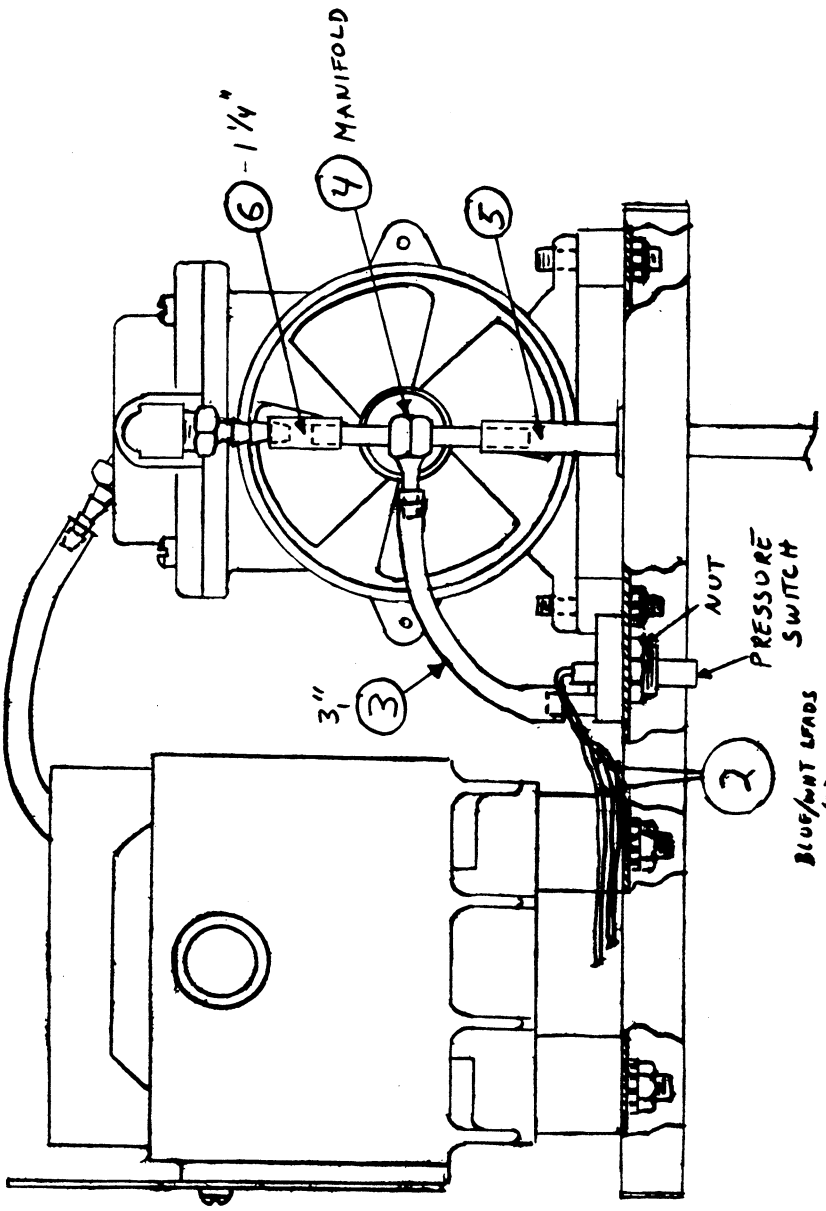
NOTE: To use kit on high pressure calibration gas tanks, a pressure regulator must be used to limit output to a maximum of 50 PSI. Also necessary are a flow control valve to control the calibration gas flow (if analyzer not equipped with Operating Mode/Gas Cal Mode switch) to approximately 30 CFH, and a ¼-inch P-to-T union to connect the flow valve to the Sun kit (No. 120-223). Having done this correctly, you may then use the low pressure hook-up procedure.

1. Before opening Gas Tank Valve, turn the Regulator Handle counter-clockwise until it rotates freely, and close the Flow Valve by turning it fully clockwise. Open the Gas Tank Valve, adjust the Regulator Handle for a setting of 10 psi on the Delivery Pressure Gauge. For the adjustment of the Flow Valve, refer to the CALIBRATION PROCEDURE.

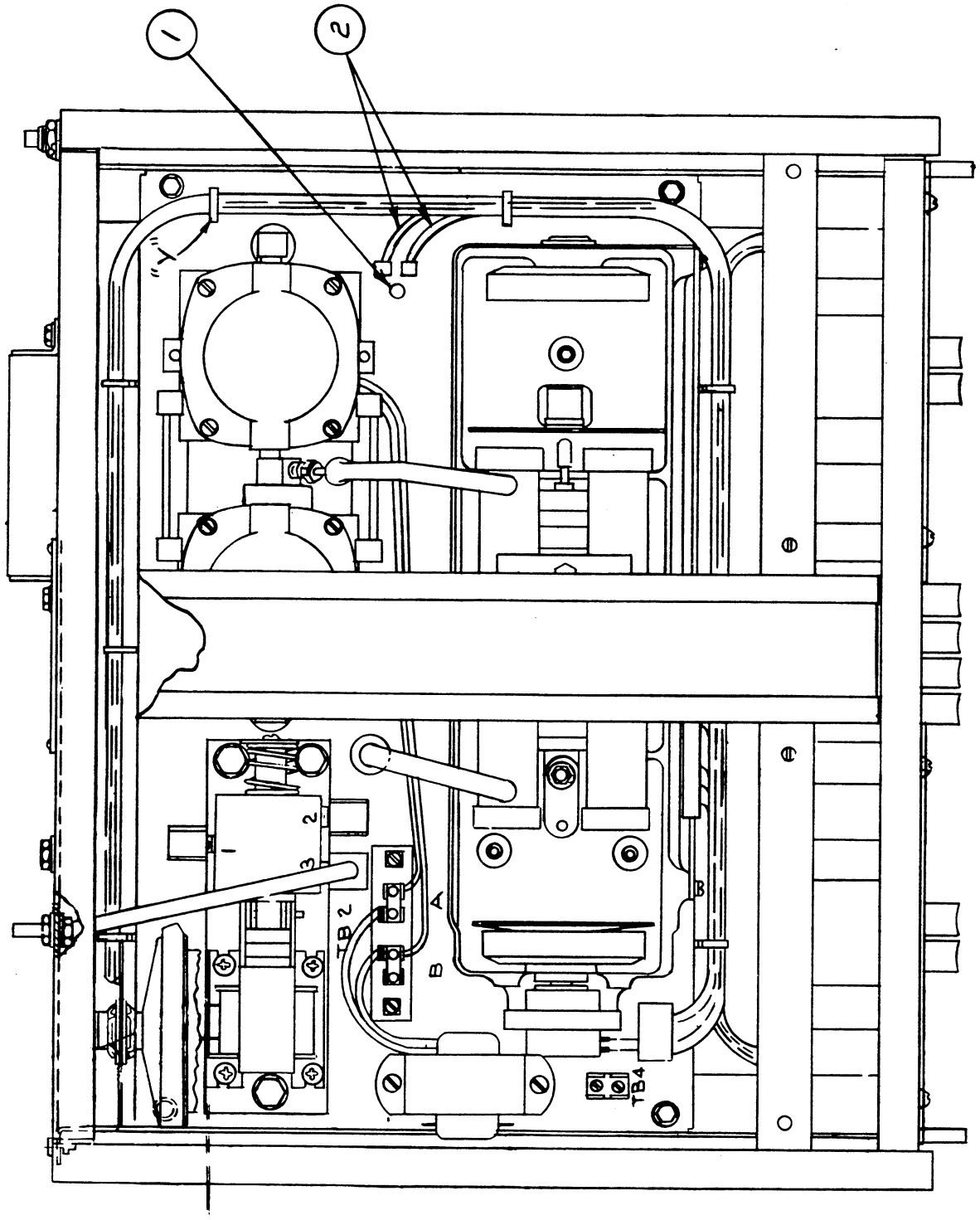
When Calibration Gas is not in use, close the Gas Tank Valve. Allow all gas to vent out until both gauges indicate zero pressure. Turn the Regulator Handle counter-clockwise until it rotates freely. Close the flow valve.

INSIDE OF BACK PANEL
FIGURE 5

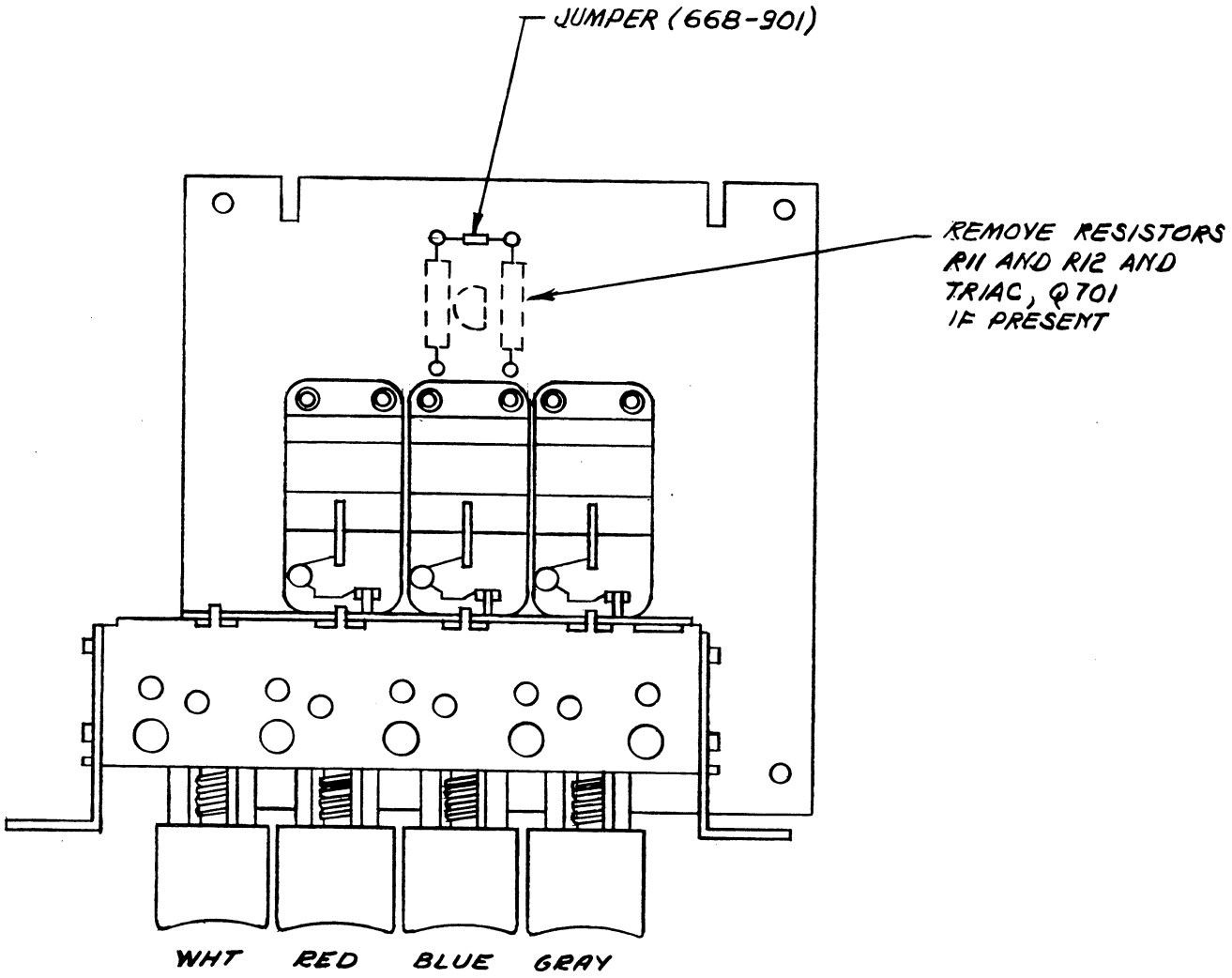




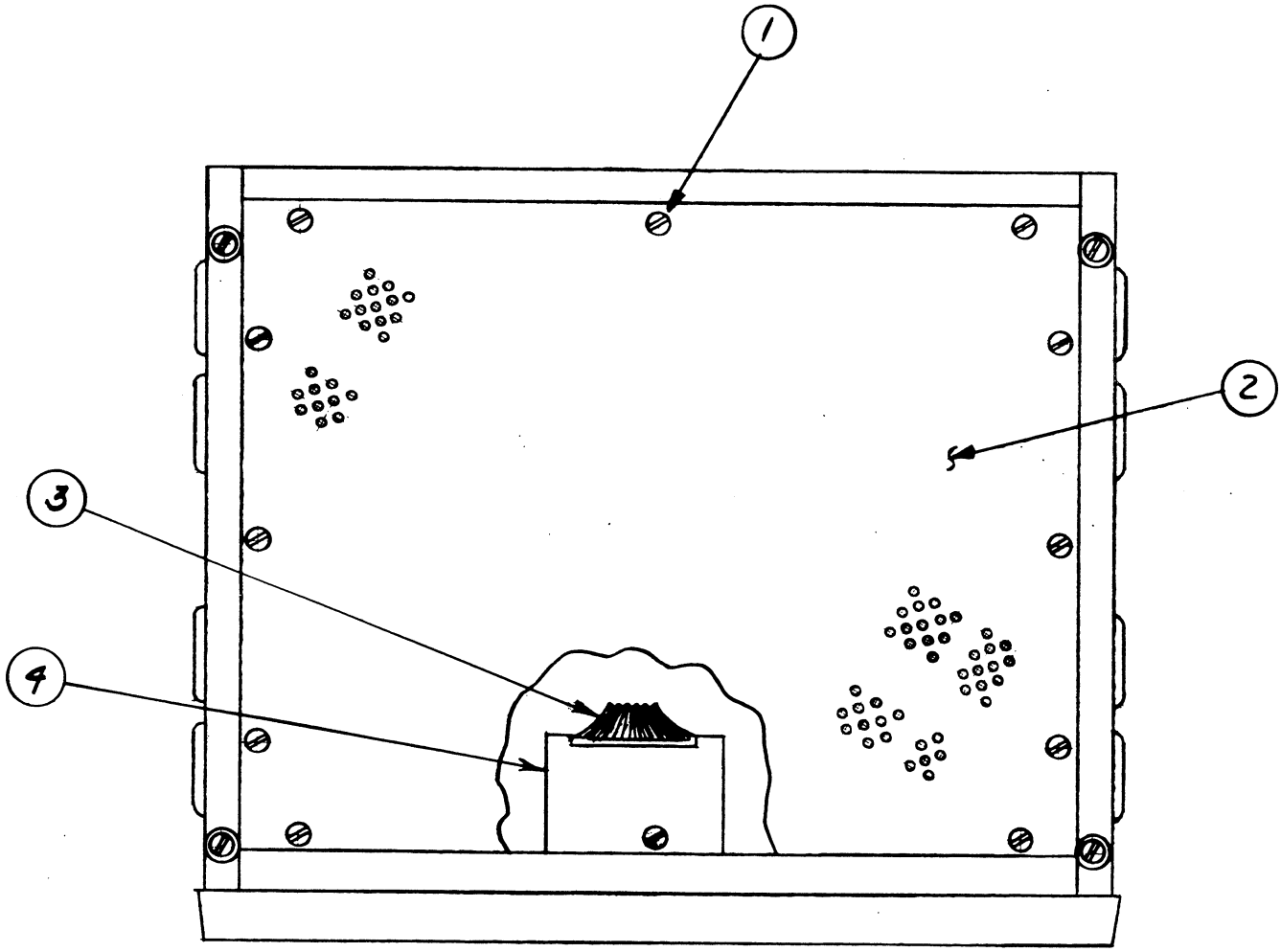
SIDE VIEW
FIGURE 4B



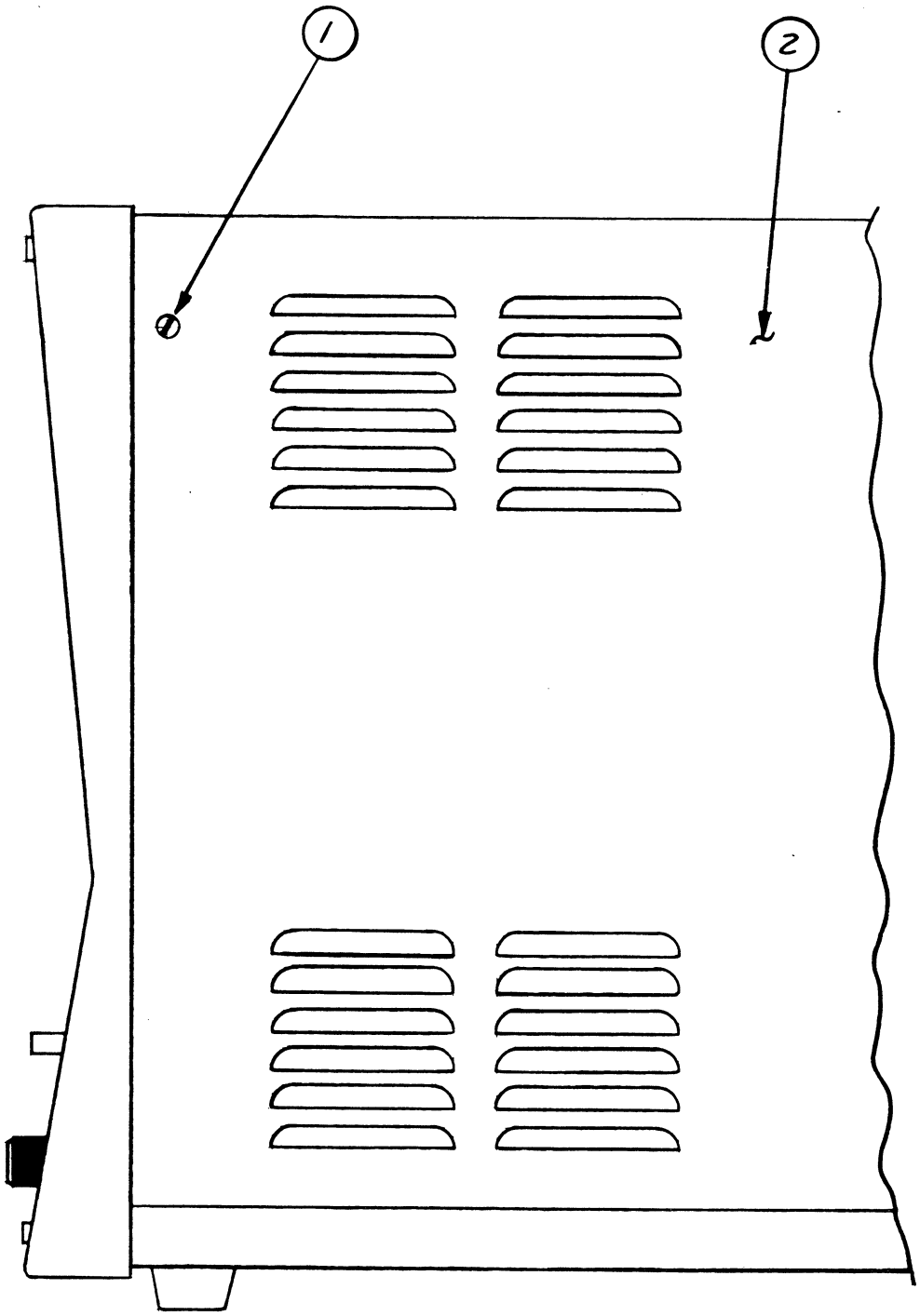
TOP VIEW
FIGURE 4A



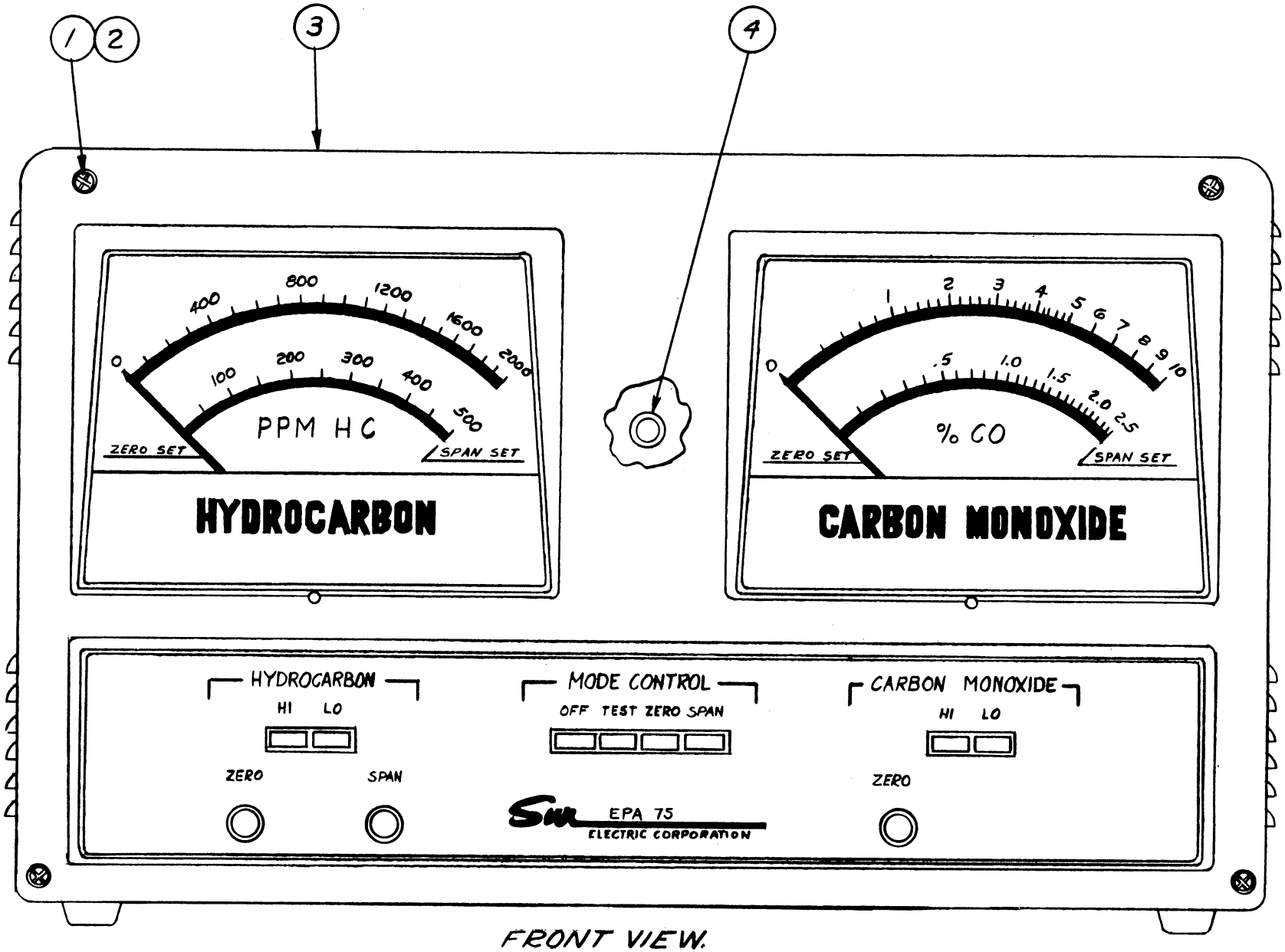
TOP VIEW
FIGURE 3A



BOTTOM VIEW
FIGURE 3



SIDE VIEW
FIGURE 2



FRONT VIEW.
FIGURE 1

EPA-75 "A" MODIFICATION KIT INSTRUCTIONS
KIT NO. 0120-0222

STEP 1

See Figure 1, unplug unit and remove (4) screws and (4) countersunk washers (Items 1 and 2), remove the front panel (Item 3). Install lamp (Sun P/N 910-004) into socket (Item 4).

STEP 2

See Figure 2, remove (2) side covers (Item 2), each cover is held in place by (2) sheet metal screws (Item 1).

STEP 3

See Figure 3. If unit is on a stand, tilt the unit up 90° (otherwise lie the unit on its top) and remove (12) sheet metal screws (Item 1) and the bottom cover (Item 2). Disconnect electrical connector (Item 3) from Power Switch P. C. Board (Item 4). Remove R11, R12 and Q701 if present and insert jumper (Sun P/N 668-901) on the Power Switch P. C. Board from the top as shown in Figure 3A, and solder in place. Connector (Item 3) can then be reconnected.

STEP 4

See Figures 4A and B. Remove nut from Pressure Switch (Sun P/N 549-0017).

Install the Pressure Switch through the hole (Item1) in the Optical Bench Shelf with the threaded end pointing towards the bottom of the unit. Replace nut and tighten. (CAUTION: Do not over tighten plastic threads). Remove shrink tubing from (2) white and blue wire leads (Item 2) and connect one wire to each of the two tabs on the Pressure Switch. Connect one end of the 3" long Plastic Tube (Item 3) to the branch of the manifold (Item 4) and connect the other end to the Pressure Switch. Disconnect the hose to the pump inlet (Item 5) and reconnect it to one end of the manifold. Connect one end of the 1¼" long Plastic Tube (Item 6) to the other end of the manifold and the other end of the 1¼" Tube to the pump inlet.

STEP 5

See Figure 5. Remove the Relief Valve Assembly (Item 1) from the chassis and from the Plastic Tube (Item 2) leading to the exhaust side of the sample cell. The hole left by removing the Valve Assembly must be enlarged with a drill to a diameter of 0.375". Insert the threaded end of the Exhaust Port (Sun P/N 7024-0325) (Item 3) from the outside of the EPA through the enlarged hole and attach with the 3/8" lockwasher and nut (Sun P/N 602-033 and 409-0029). Reconnect the Plastic Tube (Item 2) this time, to the Exhaust Port. (If this cannot be done without straining the Plastic Tube, a longer tube (19" - Sun P/N 669-229) is supplied which may be cut to the length needed.)

STEP 6

The modification is now complete. To check the system, plug in the unit and push in the test mode button. The light should come on in both the test and zero modes when the span mode button is held in.

The "span" button is used to test the lamp. (If light does not light up when "span" is pushed, the lamp could be burned out.)

The light should also come on if the Pneumatic System is blocked anywhere between the manifold added and the 75 Micron Filter while the unit is in the test mode or if the CAL. gas inlet is blocked in the ZERO mode. (If not check for leaks.)

STEP 7

Replace the bottom cover and (12) sheet metal screws that were removed in Step 3. Replace the (2) side covers and (4) sheet metal screws that were removed in Step 2. The new Front Panel with the red lens in it (Sun P/N 7009-776) can now be mounted in place of the old one with the (4) screws and (4) countersunk washers removed in Step 1.

EPA-75 "A" MODIFICATION KIT
ITEM LIST

QUANTITY	SUN P/N		QUANTITY	SUN P/N	
1	549-0017	Pressure Switch	1	2894A	Manifold
3"	669-229	Tube Plastic 3/16 ID	19"	669-229	Tube Plastic 3/16 ID
1	668-901	Jumper	1	910-004	Lamp
1	7009-776	Front Panel Sub-Assembly	1	7024-0325	Exhaust Port
1	602-0033	Lockwasher, Int.	1	0409-0029	Nut 3/8-32
1¼"	669-229	Tube, Plastic 3/16 ID			

692-857

Sun ELECTRIC CORPORATION
HARLEM AND AVONDALE • CHICAGO, ILLINOIS 60631

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Sun
PRODUCT SPECIFICATIONS

EXHAUST PERFORMANCE ANALYZER, MODEL EPA - 75™

Sun ELECTRIC CORPORATION
HARLEM AND AVONDALE • CHICAGO, ILLINOIS U.S.A. 60631

BID DESCRIPTION

Compact, solid-state, non-dispersive Infra-Red exhaust analyzer designed to measure levels of Hydrocarbons (HC) and Carbon Monoxide (CO) in the exhaust of internal combustion engines.

Tester to operate on 120 volts 60 Hz alternating current. Each unit supplied with a roll-around stand, test probe, hose and instructional literature.

Testing capability includes measurement of HC between 0-500 and 0-2,000 parts-per-million (ppm) and CO between 0-2½% and 0-10%.

FEATURES:

Each meter is completely adjustable for zeroing and span-set. All other adjustments are made at the factory.

The EPA-75 uses an internal Electro-Mechanical span reference system, which is initially adjusted to a calibration gas. Calibration may be checked either by this Electro-Mechanical span reference system or by using a certified calibration gas.

Flow indicator light illuminates when filters need cleaning or changing, or when sampling system becomes blocked.

After 15 minutes warm-up, the zero drift rate is less than $\pm$1% of full scale per hour and less than $\pm$5% over a 24 hour period.

System is ready for use after 5 minutes warm up with increased zero drift rate.

System responds to 95% of each reading within the first 7 seconds after probe is inserted into exhaust stream.

Complete system is accurate over-all to $\pm$2½% of full-scale on either meter.

System is essentially unaffected by fluctuations in line voltage and ambient temperature changes.

Electronic "noise" is less than $\pm$½% of full scale on either meter.

All solid-state electronics in detectors, signal-processing network and regulated DC power supply.

Electronics located on printed circuit board with plug-in connection for all items external to the board.

METERS:

8" back-illuminated, constructed with d'Arsonval movement, spring-back, jewelled bearings, and tamper-proof, mechanical, zero adjust. Meters to have guaranteed accuracy of within $\pm$2% of full scale and be capable of withstanding a 400% overload withoutdamage.

TESTER CONTROLS:

Interlocked, color-coded, push-button operating controls for on/off, meter-switching and mode control. Potentiometer controls for Zero and Span settings on each meter.

SAMPLE HANDLING SYSTEM:

Stainless-steel probe, 25-foot polyurethane hose, self-draining, dual-element filtering system, solenoid valve for calibration, low-flow indicator and pumping system.

MANUALS:

Operating instructions and training materials.

CONSTRUCTION:

Tester to be supplied on a roll-around stand with adequate storage space for accessories and manuals. External metal surfaces to be painted with a stain-and chip-resistant paint or chrome plated. Approximate weight 90 pounds.

SPECIFY: Sun Exhaust Performance Analyzer, Model EPA-75, or equivalent.

SUN EXHAUST PERFORMANCE ANALYZER
MODEL EPA-75™
PRODUCT TECHNICAL DATA

The Sun Exhaust Performance Analyzer, Model EPA-75, is a compact, solid-state, non-dispersive Infra-Red exhaust analyzer. It measures levels of Hydrocarbons (HC) and Carbon Monoxide (CO) in the exhaust of an internal combustion engine. Dual scales on each meter provide over-all measurement ranges between 0-500 and 0-2,000 parts-per-million (ppm) for HC and 0-2.5% and 0-10% for CO. Its lightweight, roll-around stand allows the analyzer to be easily moved from vehicle to vehicle between tests. The single-probe sampling system permits easy and rapid testing and makes the EPA-75 ideal for use in service areas associated with high traffic volumes. Tiltable mounting permits adjustment to the best angle for individual operators' viewing preferences.

CAPABILITY

Levels of HC can be read between 0-2,000 ppm and 0-500 ppm on separate color-coded scales. The same arrangement permits reading CO levels between 0-10% and 0-2.5%. Each meter is completely adjustable for zeroing and span-set. All other adjustments are made at the factory. A low flow indicator light on the front panel is illuminated when the filters need cleaning or changing, or when the sampling system becomes blocked. The system warms up and is ready for use in only five minutes, with increased zero drift rates. After 15 minutes of warm-up, the zero drift rate is less than $\pm$1% of full scale per hour and less than $\pm$5% over a 24 hour period. The tester responds to 95% of each reading within the first seven seconds after the probe is inserted into an exhaust stream. The tester provides a cross-sensitivity level of less than 0.1% of full-scale reading on the CO meter measured against a 15% CO_2 sample. The complete system is accurate overall to $\pm$2½% of full-scale reading on either meter and is essentially unaffected by fluctuations in line voltage. Electronic "noise" affects the EPA-75 less than $\pm$½% of full-scale reading on either meter.

OPERATING PRINCIPLES

The EPA-75 is a non-dispersive Infra-Red gas analyzer which operates on the principle of absorption of specific wavelengths of infra-red energy by CO and HC (as N-Hexane) present in the sample exhaust stream. It uses a dual-beam analyzer with separate air reference and sample cells mounted on a single frame to provide great stability to the system. At one end of the frame is an infra-red heat source operated by 120-volt AC, 60 Hz electric power. A pre-focused concave mirror reflects the energy from the source which is chopped by a motor operated chopper, which also controls reference and signal synchronization LED devices.

At the opposite end of the frame, a second reflective mirrored surface focuses the transmitted energy through two optical filters sensitized to transmit energy at wavelengths in the CO and HC spectrums of interest onto two lead selenide detectors.

Air in the sample cell allows maximum chopped energy to be transmitted through the cell and on through the optical filter to the CO and HC detectors. Passage of exhaust gases through the sample cell absorbs infra-red energy in the spectrum of the wavelength of interest, reducing the energy available to the CO and HC detectors, depending upon the concentrations of the two gases in the sample stream. The detectors thus provide an alternating current signal proportional to the amount of energy absorbed at the chopper frequency.

The signal from each lead selenide detector is then fed through its own preamplifier and on through separate processing channels to the meters for display.

The reference signal from the LED is synchronized with the signal passing through the air reference cell to the detector. This electronically clamps the detector reference signal to a ground reference.

Automatic Gain Control circuits detect and feed a signal back through an optically-coupled insolator circuit to control the sample signal levels for each channel at a convenient voltage. This signal is by-passed to a solid-state operational amplifier. At this point the zero potentiometers on the front panel can be rotated to adjust the meter pointers to zero.

The signal synchronization output is finally fed to a Field Effect Transistor switch which permits the sample signal to be integrated and read out on the meter.

CIRCUITRY

The EPA-75 operates on 120-volt 60 Hz alternating current, drawing an average of 4.0 amperes.

The EPA-75 is designed to the latest state of the art and contains all solid-state electronics in the detectors, signal-processing network and the regulated DC power supply. The electronics are located on a printed circuit board having plug-in connectors for all connections external to the board.

An electrically-operated motor drives a mechanical calibrator which permits the unit to be user-calibrated using the Span potentiometers located on the front panel whenever the Span push-button is depressed.

The circuits are designed to operate satisfactorily between 95 and 125 volts AC line power and within a temperature range of 32° and 120° F. All components are of approved design and of the best commercial quality.

CALIBRATION

The EPA-75 uses an internal Electro-Mechanical span reference system, which is initially adjusted to a calibration gas. The analyzer can be calibrated with this Electro-Mechanical span reference system and does not require gas calibration. However, this unit has the capability of being calibrated with a certified span gas should local, state and/or Federal legislation so dictate, and features a calibration gas inlet and a calibrating mode switch designed to conserve on calibration gas. If gas calibration is desired, the gas calibration kit, 120-223, is required to connect the span gas container to the tester.

METERS

8" meters are used to provide maximum scale size. Each meter has dual, color-coded scales controlled by color-matched push-button switches located directly beneath each meter. The meters are back-illuminated for shadow-free viewing. They are manufactured by Sun Electric Corporation, feature d'Arsonval movements and have spring-back, jewelled bearings. Accuracy of the meters themselves is guaranteed to be within $\pm$2% of full-scale deflection. The meters can withstand a 400% overload without damage.

TESTER CONTROLS

Color-coded, push-button switches control meter switching, tester ON/OFF and operating modes. The HI and LO meter switching buttons are color-coded to match their respective scales on the meter faces and are located directly beneath the meter they serve. The individual adjustment knobs for Zero and Span adjustment are located just below the meter switch buttons. The red-jewelled check filter indicator lamp is located mid-way between the meters, near the top of the panel.

SAMPLE HANDLING SYSTEM

The sample handling system consists of a stainless steel tail-pipe probe, a 25 ft. polyurethane hose, a self draining water system, a dual-filter sample system, an electro-mechanically operated solenoid valve for calibration, a low-flow indicator, and a pumping system to push the sample through the emission analyzer. The pump/filter combination ejects condensed moisture into the atmosphere, rendering the system self-draining.

MANUALS

Illustrated instruction and training material is included with each analyzer.

CONSTRUCTION DETAILS

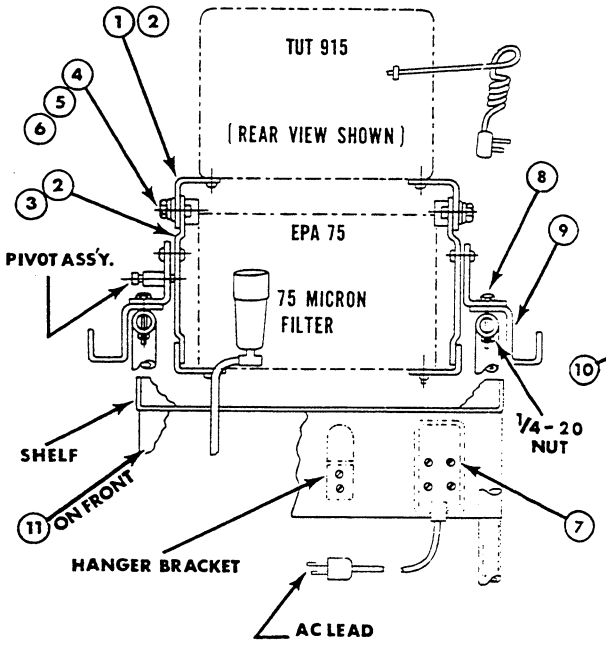
The instrument enclosure is constructed of heavy-gauge formed steel finished in a silicone-base stain, chip and scratch-resistant blue enamel. The front panel of the tester is a molded, red polystyrene material, resistant to impact, staining and cracking. The analyzer's dimensions are 20 1/4" wide, 12 1/4" high and 20 1/2" deep. It is mounted on a Sun Model PTS-24-3 portable test stand. The mounting hardware allows the tester to be tilted in 5 steps through an arc of 30° for the most convenient viewing angle. The stand is constructed of

20-gauge steel, painted with the same enamel as the tester, and 1" diameter 18-gauge chrome-plated steel tubing. Its two shelves provide storage space for accessories and manuals. The test stand has four ball-bearing, full-swiveling 3" casters, 1 1/4" wide, to allow easy moving of the analyzer. Two of the casters are equipped with quick set locks as an added convenience. The over-all dimensions of the analyzer and stand are 48" high, 24" wide and 21" deep, weighing approximately 90 pounds.

The EPA-75 is shipped complete with probe, hose, instruction materials, spare filters and the ready-to-assemble test stand. The shipping weight is approximately 97 pounds.

Sun ELECTRIC CORPORATION
INSTALLATION INSTRUCTIONS

Dual Mount Kit
TUT 915, EPA 75



PARTS LIST

ITEM	QTY.	DESCRIPTION	P/N
1	2	BRACKET, UPPER	2365-371-01
2	8	SCREW—SEMS 10-32x3/8 HEX SLT. HD.	0615-0012
3	2	BRACKET ASS'Y	7020-1293-01
4	4	SCREW, 1/4-20x3/8	675-109
5	4	FLATWASHER—1/4	400-20
6	4	LOCKWASHER—1/4	603-8
7	1	PLATE, MTG. ASS'Y	7009-894-01
8	4	SCREW, 1/4-20x1 1/4	675-15
9	2	HANGER, SIDE	2161-0020-01
10	1	PANEL, FRONT ("SUN SERVICE EQUIPMENT")	7003-0387

THIS KIT WILL MOUNT SUN TUT 915 TESTER ATOP SUN EPA 75 TESTER WHEN UTILIZING A PORTABLE TEST STAND.

THE KIT ENABLES THE SUN TUT 915 TO BE REMOVED FROM THE DUAL ASSEMBLY FOR REMOTE OPERATION OR SERVICING, WHILE THE EPA 75 TESTER REMAINS ATTACHED TO THE STAND.

THE KIT IS COMPLETE, REQUIRING NO HOLES TO BE DRILLED AND READILY INTERFACES WITH THE PORTABLE STAND.

THE KIT OFFERS STORAGE SIDE HANGERS FOR HOSE AND ELECTRICAL LEADS, AN INTERNAL HANGER FOR TESTER INPUT POWER CORDS AND AN ELECTRICAL BOX WITH A 16 FT. LEAD FOR 110V. GROUNDED SYSTEM INPUT POWER.

OTHER FEATURES OF THE KIT INCLUDE "SUN SERVICE EQUIPMENT" FRONT PANEL.

ASSEMBLY PROCEDURE:

1.0 ON EXISTING TESTERS MOUNTED ON PORTABLE TEST STANDS PROCEED AS FOLLOWS.

1.1 DE-ENERGIZE THE ELECTRICAL SYSTEM BY DISCONNECTING THE INPUT CORD FROM THE WALL OUTLET.

1.2 REMOVE THE FILTER DRAIN TUBE FROM THE TWO CLIPS HOLDING IT TO THE REAR OF THE STAND.

1.3 REMOVE THE TESTER FROM THE PORTABLE TEST STAND AND LOCATE ON A SOUND SURFACE TO PREVENT DAMAGE TO TESTER CORDS ETC.

1.4 IF THE PORTABLE TEST STAND CONTAINS ANY SIGN OTHER THAN "SUN SERVICE EQUIPMENT" REMOVE THE SIGN AND REPLACE WITH THE "SUN SERVICE EQUIPMENT" SIGN ITEM 10.

1.5 REMOVE BLANK PLATE 7003-381-02 AND ATTACH THE MOUNTING PLATE ASS'Y 7009-894-01, WITH THE BRACKET AND THE ELECTRIC BOX INBOARD OF THE PORTABLE TEST STAND.

1.6 REMOVE THE PIVOT SUPPORTS FROM THE PORTABLE TEST STAND AND ATTACH THE EXISTING PIVOT SUPPORTS TO THE STAND TUBING WITH SIDE HANGERS, 2161-0020-01 AND THE 1¼ LONG SCREWS AS SHOWN.

2.0 REMOVE THE EXISTING SIDE SUPPORT BRACKET ASSEMBLIES ON THE TUT 915 TESTER (IF REQUIRED) AND ATTACH TWO 7020-1293-01 BRACKETS WITH 4 SCREWS AS SHOWN PER DRAWING. PLACE TESTER INTO PORTABLE TEST STAND.

2.1 ATTACH TWO UPPER BRACKETS 2365-0371-01 TO THE TUT 915 TESTER AND ASSEMBLE TO SIDE BRACKETS #7020-1293-01 WITH ITEMS 4, 5, 6 (SCREWS, FLAT WASHERS AND LOCKWASHERS).

NOTE: THE FOUR (4) REST BUMPERS OF THE TUT 915 MUST BE IN CONTACT WITH THE LOWER EPA 75 TESTER COVERS WITH A SLIGHT DOWNWARD PRESSURE BEFORE TIGHTENING THE ATTACHING HARDWARE.

2.2 PULL OUT THE TILT DETENT PIN AND INDEX THE TESTERS TO ALL PIN HOLE POSITIONS TO VERIFY THAT NO CONDITIONS EXIST WHICH PREVENT THE PIN FROM READILY ENGAGING AND DIS-ENGAGING.

NOTE: IF SOME POSITIONS EXPERIENCE DIFFICULTY REWORK THE PIN HOLES AS NECESSARY—REFERENCE TO HOLE SIZE AS .261 ± .002 DIA. (UNPAINTED).

2.3 VERIFY PORTABLE TEST STAND INTEGRITY BY CHECKING ALL HARDWARE FOR ASSEMBLED SOUNDNESS.

3.0 PLUG THE CORD OF EACH TESTER INTO THE ELECTRICAL SERVICE BOX OF THE PORTABLE STAND AND NEATLY WRAP THE SURPLUS CORDS ABOUT THE INTERNAL HANGER.

FOR TEMPORARY USE COIL THE INPUT POWER CORD ON THE LOWER TESTER SHELF.